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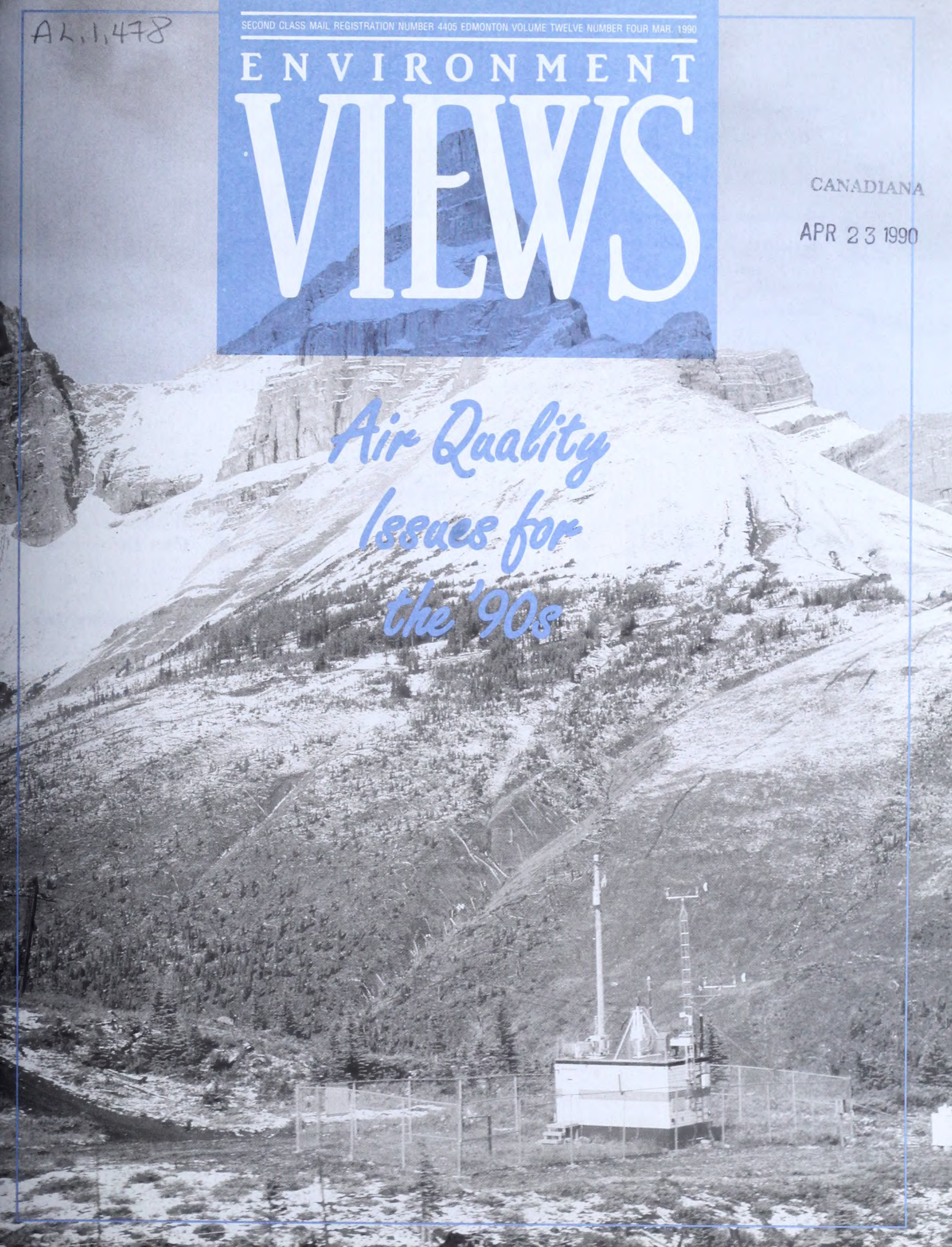

Air Quality Issues for the '90s

ENVIRONMENT
VIEWS

Cover photo by Allan Legge: ADRP monitoring trailer at Fortress Mountain.

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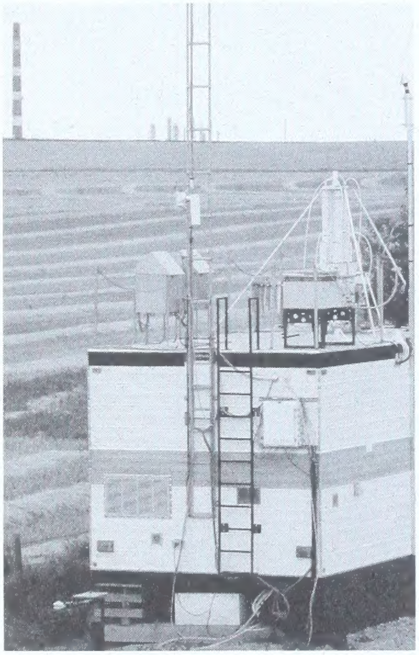

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Environment Views is published quarterly by Alberta Environment. Each issue deals with a specific topic from various viewpoints with the aim of increasing awareness of environmental issues among Albertans. *Environment Views* is directed by an independent board with representation from environmental groups, government and industry. The views expressed by the publication are not necessarily those of Alberta Environment.

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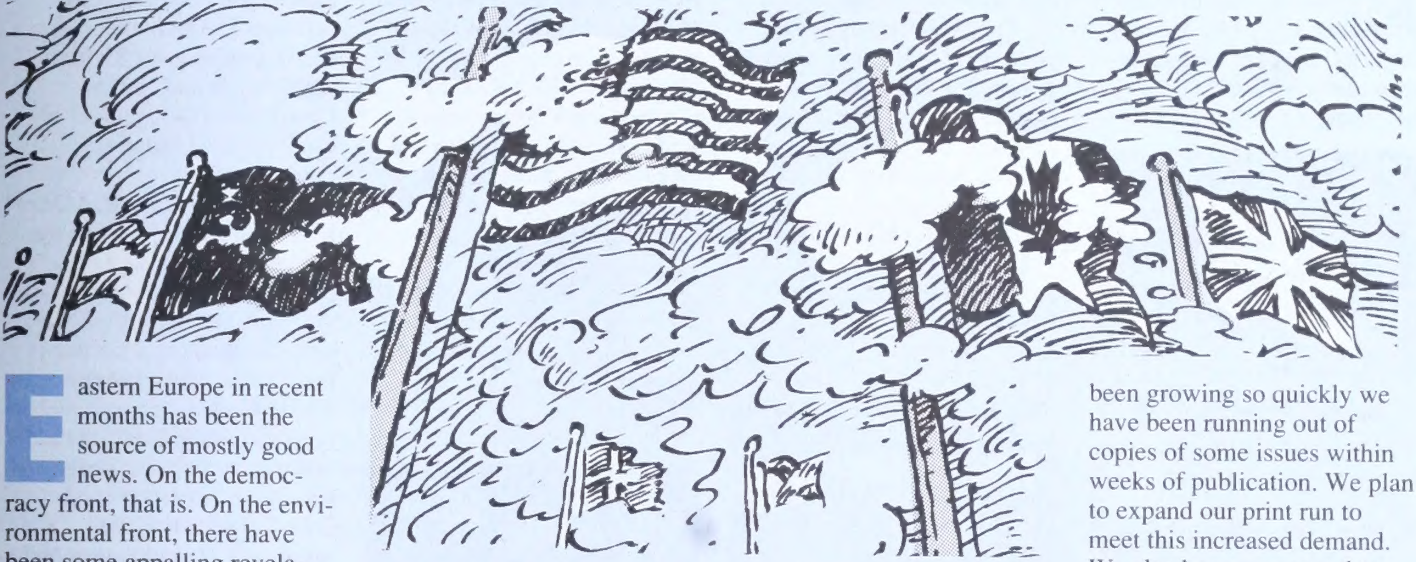
Alberta
ENVIRONMENT

EDITOR'S NOTEBOOK

Air Quality Issues for the '90s



Eastern Europe in recent months has been the source of mostly good news. On the democracy front, that is. On the environmental front, there have been some appalling revelations. Closed societies in single-minded pursuit of productivity, employment and exports have allowed industry free rein at the expense of the environment, with tragic consequences in East Germany, Latvia and elsewhere. It may not be too late to clean up some of these areas, closing down the worst polluters and refitting other sources of water and air pollution and toxic wastes. It can only be hoped that the world as a whole will lend support to this work, so the people will not have to suffer further as a result of the changes that have to be made immediately.

In contrast to the story in Eastern Europe, parts of the Third World and even in eastern North America, it really doesn't seem Alberta has much to worry about when it comes to air pollution. That's the conventional view, and it was at least partly upheld by last year's final report of the Acid Deposition Research Program. The program's multimillion-dollar study showed that we there are very low concentrations of acid pollutants in Alberta's air now, but that we need to be concerned about the impact of future industrial development, especially in acid-sensitive regions of the province.

That's a relief, but as the report points out, it does not mean that we can afford to do nothing. Air pollution does not respect political boundaries (for example, the supposedly pristine air sampled at Fortress Mountain revealed ozone apparently transported from the cities of B.C and Washington State). In air quality, as in other environmental concerns, we need to think globally and act locally.

As a province, we must be aware of the contribution of our industries (and the policies and regulations which govern them) to global air quality concerns. Although we are not heavily industrialized, our energy industry makes us a significant contributor of carbon dioxide. As individuals, we must raise our awareness of how our action can affect air quality (see story page 23 for some tips on conserving energy and shopping wisely).

Our stories in this issue look at the important work of the ADRP, at its final report and recommendations, and help to answer some important questions: Where do we go from here? What are the air quality concerns of the next decade and beyond?

We have been very pleased in the last few months by the great response we have had to our recent issues on such topics as personal action, forest management, environmental education. We love it when we get letters telling us we are important to you. You have been saying you appreciate our balanced coverage of these issues, and the forum we provide for a range of viewpoints.Our plans for the next year include doing a little promotion, so that we can reach more Albertans interested in the environment, especially those outside the major cities. Even without promotion, our circulation has been growing so quickly we have been running out of copies of some issues within weeks of publication. We plan to expand our print run to meet this increased demand. We also hope to respond to complaints about recurring problems with our mailing list by revamping it and gaining the capability to maintain it ourselves. This will mean we can react more quickly and reliably to new subscription requests and avoid wasteful duplicate mailings.

But all this will take money. Over the next few weeks, decisions will be made about next year's spending. In the wake of the federal budget, there is talk of widespread cuts in provincial spending. If you feel that it is important to maintain the quality of Environment Views, and make these changes to broaden our circulation, will you make your views known? You can write to the editor at the address opposite or directly to

Ralph Klein,
Environment Minister,
130 Legislature Building,
Edmonton T5K 9Z9.

The editor of Environment Views, *Maryhelen Vicars is a freelance writer and editor based in Edmonton.*

AROUND THE PROVINCE *by Cathie Bartlett*

The Bag Lady

A Calgary woman tired of plastic and paper grocery bags designed her own re-usable fabric bags and ended up launching a business.

GOVERNMENT OF ALBERTA

Soon after she finished sewing a set of bags for herself last October, fellow shoppers began stopping Marilyn Negropontes to ask where she got the vibrant pink, purple, green and yellow nylon bags. Cashiers didn't mind packing Marilyn's groceries in the bags, either.

So Negropontes and her sister, Nancy Gardiner, got busy at their sewing machines and started producing the light, washable, webbing-handled bags in sets of four. Demand grew, especially after Negropontes was interviewed on radio in Edmonton and Calgary, until the pair could no longer keep up with the demand. In late January, Negropontes travelled to Montreal and found a long-standing sports bag manufacturer, Blondy Manufacturing, to produce them according to her standards.

The price will stay the same – four bags for $25 – and the bags will be marketed through telephone and mail order.

"If we went through retail outlets, the price would have to go up," Negropontes said.

Her next business challenge is to get grocery stores to stock the fabric bags. She is hopeful, after approaching a few major grocery chains and finding they're all keen on reduced packaging.

Her administrative, sales and marketing experience from her previous work in a real estate office and advertising firm are standing her in good stead as the new venture grows. She has registered The Bag Lady name across the country.

She can be reached at:
The Bag Lady, Suite 1100,
633 - 6th Ave. SW, Calgary
T2P 2Y5
261-7676 (telephone)
233-7119 (fax)

Mandatory EIAs on the Horizon

A new government task force has started laying the groundwork for mandatory environmental assessments in Alberta.

Environment Minister Ralph Klein created the six-member force after deciding he couldn't wait until the conclusion of the extended federal-provincial inquiry into the proposed Alberta-Pacific pulp mill project at Athabasca, says Rod Love, Klein's executive assistant.

Klein hopes to bring in draft legislation governing environmental impact assessments at the spring sitting of the legislature. Currently, environmental scrutiny and the form it takes is entirely at the discretion of government ministers.

The six-member panel includes representatives from Alberta Environment, the Canadian Petroleum Association, the Alberta Forestry Association, as well as environmental activist Martha Kostuch. The chairman is Ron Peiluck, president of Lombard North Group in Calgary.

Brian Staszenski, a member of the task force and director of the Environmental Resource Centre, called the move exciting and says "it's about time." He noted the government's last attempt at upgrading the environmental impact study process went nowhere following workshops in 1980.

The task force will be examining ways to improve public involvement in the process, including intervener funding.

Growing Wildlife Habitat

Landowners all over the province are doing their bit to increase animal habitat under a program the Red Deer River Naturalists launched in 1987.

Some 72 landowners have set aside more than 9,200 acres under the habitat steward program. The special areas extend from LaCrete to the north, Altario in the east, Crimson Lake to the west and Turner Valley to the south, says program co-ordinator Murray Mackay of Ponoka.

The program appears to be working, Mackay says, mentioning one farmer at Dorothy, south and east of Drumheller, whose habitat area attracted 11 pairs of burrowing owls this year.

A minimum of five acres is required, and landowners can contact the Kerry Wood Nature Centre in Red Deer or any club member for an application form.

Those with less than five acres can participate in the Back Yard Wildlife Program, for which the club produced a booklet about setting out food for animals and other related topics. The book has sold between 350 and 400 copies and is available for $5 from the Kerry Wood Nature Centre, any club member or the Provincial Museum bookstore.

Mackay says the Red Deer River Naturalists took on the project after hearing Lorne Scott of Regina, a member of the Canadian Wildlife Federation, speak about a similar program in Saskatchewan. The naturalists' program borrowed the habitat steward name from a similar program run by the Alberta Fish & Game Association, that involves 137 landowners and 14,500 hectares of land set aside for all kinds of wildlife. Club members go out and ask landowners to allow their land to be used for encouraging habitat, says Brad Fenson, habitat development co-ordinator.

In an unusual move, the Red Deer River Naturalists took out a private conservancy lease for 20 acres from a farmer in the Lacombe area.

The site is home to 15 species of orchids and the rare narrow-leaved sundew, an insectivorous plant. Location of this site is being kept under wraps, because the land is "incredibly sensitive," club past-president Myrna Pearman says. Even the club member who pays the lease doesn't know the location.

"Our prime concern is to save that habitat…

"In order to preserve it, it cannot have people visiting it, at least not in large numbers."

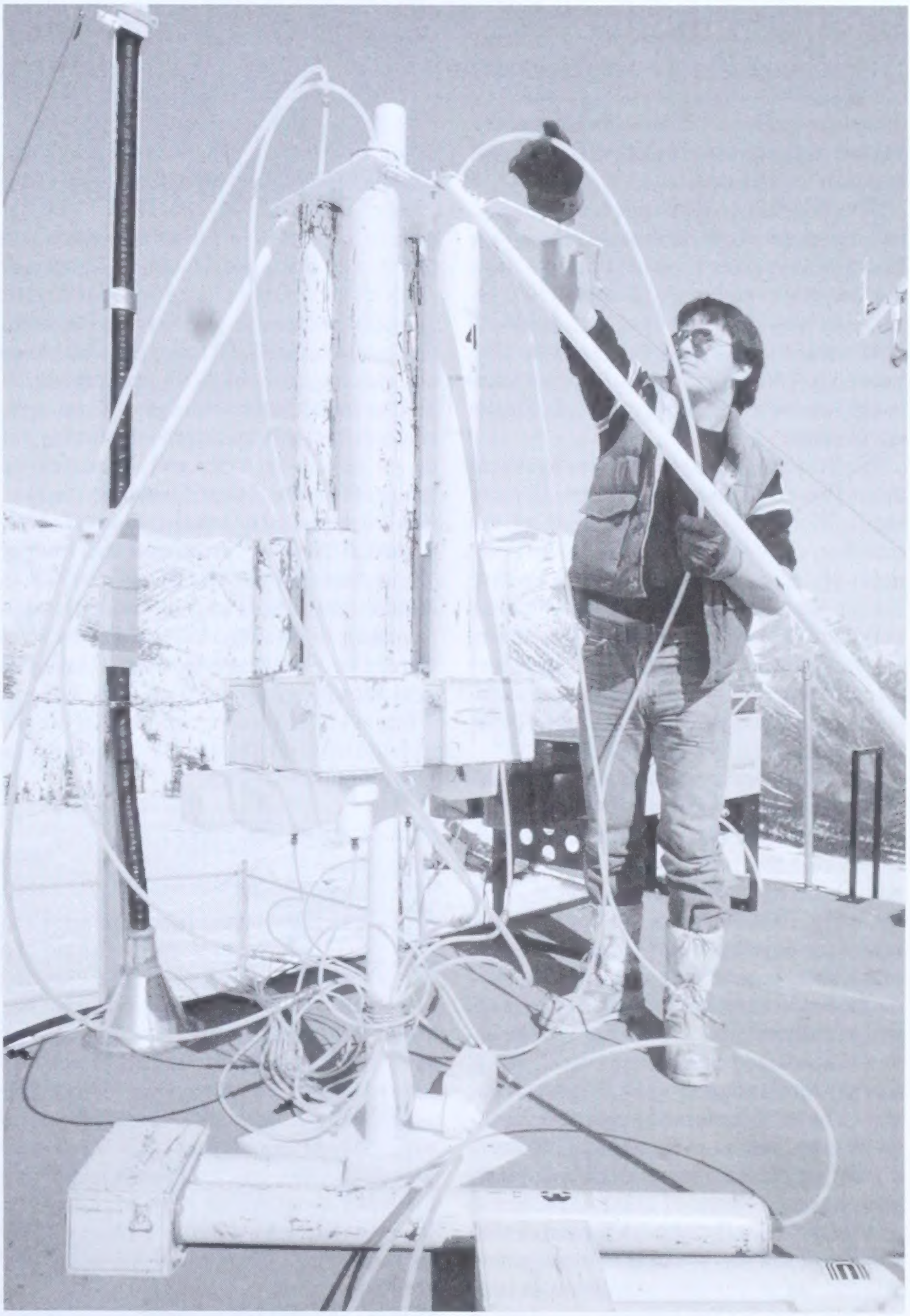
The club will take care of the land, and plans to fence it and monitor it.

Around the Province
continues on page 31

Eric Bailey

THE ADRP: Achievement and Controversy

Good news is no news?



ALLAN LEGGE

Air quality monitoring at the ADRP Fortress Mountain site.

Do you remember a time before the depleting ozone layer, the greenhouse effect, toxic waste and pulp mills muscled acid rain out of the spotlight? If so, you may remember the Acid Deposition Research Program (ADRP) in Alberta that began informally in 1983, cost over $10 million, involved over 150 specialists and turned in its ground-breaking final report in March last year? No? Well, you're not alone.

What the media and the public seemed to notice about the ADRP was the controversy that sometimes surrounded the study, not the actual results. By the time the air had cleared amid the lingering acrimony between some program members and the disputes over the scope and methods of some parts of the study, public attention had turned elsewhere.

The important results and recommendations of the program arrived quietly, almost unnoticed, on desks in the government and industry offices that had commissioned and paid for them. Perhaps this is because the results were, on the whole, good news and the only sour notes were obscure and depicted an uncertain but manageable future.

Effects of Acid Deposition in Alberta

The ADRP was formally established in 1984 "to provide a comprehensive understanding of the effects and consequences of acid-forming gases on the environment of Alberta."

Half the cost of the program was borne by Alberta Environment, 34.6 per cent by the Canadian Petroleum Association, 10 per cent by the Energy Resources Conservation Board and 5.4 per cent by a public utilities group made up of three of the province's major generators of electric power. In effect, 40 per cent of the study was paid for by

The ADRP's five objectives:

- to provide a comprehensive understanding of the effects and consequences of acid-forming gases on the environment,
- to provide a scientific basis for sound, long-term environmental management and regulatory control with respect to acid-forming gases,
- to disseminate such information among members, to the public and to government bodies,
- to undertake any research deemed appropriate, and
- to encourage and include opportunities for public representation in the ADRP.

the major producers of acid-forming emissions in Alberta and the other 60 per cent was publicly funded.

"The Canadian Petroleum Association had a concern about acid deposition," says Ron Findlay, general manager of environmental affairs and safety for Amoco Canada who was co-chairman of the members committee that directed the program. "We wanted to know if, in spite of current standards, we were causing a problem for the environment."

Ed Brushett, manager of environment protection at the Energy Resources Conservation Board, also a co-chairman of the members committee said, "The board is not normally a research organization and we don't normally fund research but we have a very strong interest in acid deposition, especially with regard to the sour gas industry. Sulphur must be conserved as a resource and it poses an environmental problem."

The project sprang from a recommendation made by the Alberta Petroleum Industry/Government Environment Committee (APIGEC) that was founded in 1972 to advise the environment minister. Back in the early '70s, Albertans (along with the rest of the developed world) became aware of the large-scale effects of acid deposition on the environment. We learned that lakes in the northeastern United States, southeastern Canada and Scandinavia were dying, forests were being damaged, the great sugar maple bush of eastern Canada was threatened, even statues on Parliament Hill were dissolving. In *Environment Views*, we reported the concerns of the Saskatchewan Research Council that acid-forming emissions from oil sands plants in northeastern Alberta were causing similar effects in northwestern Saskatchewan.

Complaints streamed into local boards of health, Alberta Environment, and to industries responsible for emissions, about the health of people and animals near sour gas plants, pulp mills and coal-fired electrical generating stations. Farmers complained that fences, machinery, metal buildings and vehicles rusted more quickly downwind of gas plants and that crop yields were lower in those areas as well. The sour gas well blowout at Lodgepole in 1982 precipitated an avalanche of news stories about sour gas, acid rain and the threat to health that might be presented by toxic emissions from a range of industrial sources in the province.

A small, industry-funded study was conducted in the West Whitecourt area (part of "Sour Gas Alley") beginning in 1973 to research the effects of sour gas on the surrounding forests. By 1979, APIGEC had formed a committee to look more closely at acid-forming gases in the environment on a wider scale and recommended that the petroleum industry and the provincial government set up the ADRP.

Boards and Committees

A members committee was formed from among the sponsors of the program and work was officially underway by late 1983. The members saw the program as involving two components: effects on human health and biophysical effects. Scientific and public interest workshops led to the establishment of two scientific advisory boards (SABs), one for human health and the other biophysical. A third board was later established – a public advisory board to represent the public's views to the members committee and to the SABs, and to help the members committee communicate results to Albertans.

The scientific advisory boards consisted of members of the North American scientific community prominent in fields related to the research. The SABs worked from the objectives of the program, input from the members committee and from ideas from a public interest group workshop to devise the terms of reference for three studies: a biophysical research program, the Southwest Alberta Medical Diagnostic Review and an occupational health study.

Once terms of reference were available, the members committee called for tenders to find qualified research teams to carry out the work. The SABs reviewed the submissions, passed judgment on the quality of the science proposed and selected the research teams, suggesting modifications to research programs as required.

Sure You Feel Bad, But Are You Sick?

The Medical Diagnostic Review (MDR) has received the greatest public scrutiny of the three projects mounted by the ADRP. The main research question of the MDR was "whether there existed a possible 'epidemic' of adverse health among people in the index area." The index area consisted of the communities of Twin Butte, Hill Spring, Mountain View, Glenwood and Willow Creek, all in the Pincher Creek area. This is a region where residents had long complained of serious health problems that they felt could be attributed to the operation of a sour gas plant in the region.

In 1985, the research contract for the MDR was awarded to the McGill Interuniversity Research Group. Essentially what they did was to compare the health of residents in the index area to the health of two control groups in other areas of the province. The group examined more than 3,600 adults and children in the study area, administered more than 2,000 questionnaires and reviewed more than 25 years of health records.

In effect, the MDR found the population of the index area and the control populations to be comparable in their health status. The research group concluded: "The greatest concerns of the population in the index area were about excess mortality, high rates of cancer, diminished respiratory function, dangerous levels of trace metals in the body, higher rates of unfavorable reproductive outcomes and birth defects, and delayed or abnormal childhood development. For all the foregoing concerns we have not de-

GOVERNMENT OF ALBERTA

Alfalfa (foreground above) is a crop sensitive to acid deposition. Yields in the Barrhead area seem to have been affected by pollution.

tected objective evidence to perpetuate the concerns."

The study group also attributed at least part of the higher incidence of complaints about symptoms of a more minor nature to the population being more aware of their health and sensations after "a quarter century of equivocal information about health in relation to the immediate environment which has been diffused in southern Alberta."

The MDR came under a great deal of criticism from other health professionals and special interest groups even though a members committee survey of area residents conducted by Decima Research apparently showed "more than 75 per cent of residents in that area remain reassured by the results of the MDR."

The criticisms levelled at the study included charges that neither of the control populations were in areas free from emissions of the kind found in the index area, that studies of metals in residents' bodies were not complete, that measurements of health were not timed to coincide with periods of exposure to emissions, that the reasons for variations in health between different "clusters" of residents within the overall index area were not investigated, and that complaints of minor ill health were ignored.

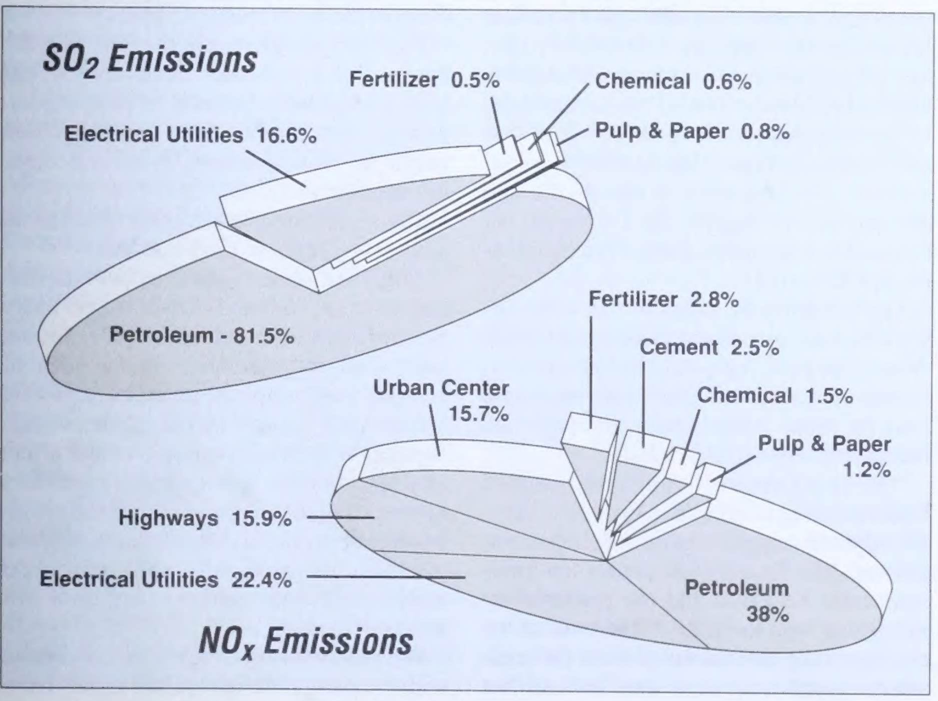
Peter G. Mahaffy, a chemistry professor at King's College, Edmonton and member of the science advisory committee of the Environment Council of Alberta (ECA) said his strongest criticism of the MDR is "the way it has been perceived and presented. A lot of people have been under the impression this study could answer whether or not there are human health effects from living next to sour gas plants when the study said this wasn't the question it was meant to answer. Instead, the question it meant to answer was: 'Is this population quite ill?'"

The SAB overseeing the health study agreed in part with some of these criticisms but pointed out that it was not within the scope of the study to detect "temporal fluctuations in symptoms" nor to study "the health effects of any specific source of pollution." The SAB did note "consistently high rates of symptoms relating to the eyes, nose and lower respiratory tract that could result from exposure to an airborne irritant or allergen" but that these were "not indicative of a serious underlying health problem." As critics claim, the study indicates that while people in the study area may not be seriously ill, many of them have symptoms to complain about.

The health of workers in industries that produce acid-forming emissions was also a concern of the ADRP, and the SAB for human health recommended a study be conducted to determine the feasibility of a full-blown occupational health study.

The Occupational Health Program at the University of Alberta was contracted in 1986 to carry out the feasibility study and in 1987 turned in its findings. What they proposed was a three-stage, $1 million study of the health of workers in Alberta's sweet gas, sour gas and thermal plants.

While the members committee seems to have accepted the general concept of such a study, they expressed some reservations about the costs and timing of the project. They finally concluded that a study of occupational health in these industries was outside the mandate and terms of reference of the ADRP and recommended that the petroleum industry undertake further research along those lines. This recommendation is noteworthy because it is one of only a few of the ADRP's many recommendations that suggested the implementation of activities that are not totally reliant on government involvement.



GRANT ELSTON

KANANASKIS CENTRE FOR ENVIRONMENTAL RESEARCH

Dr. Allan H. Legge

How Dirty Is Clean?

The Biophysical Research Program (BRP) was really the core of the ADRP – the kind of program the petroleum industry and Alberta Environment had been planning when they established the ADRP.

They already knew what the major sources of acid-forming emissions in the province were (see chart). What they wanted to find out was:

"At the present time, are there environmental problems with deposition on Alberta's crops, forests, soils, streams and lakes? and

"If not, where and when and under what conditions will such effects occur?"

Like the Medical Diagnostic Review, the Biophysical Research Program had a blue ribbon science advisory board composed of 11 scientists from across North America (in fact, only two were Canadian and none were from western Canada, a fact that later led to charges that the SAB didn't adequately represent the concerns of Alberta scientists and the public). They set the terms of reference for a study costing $5.3 million and that was awarded late in 1984 to a consortium of researchers in the public and private sectors led by the University of Calgary's Kananaskis Centre for Environmental Research.

The scientists involved in the study believed what many researchers in the field in Alberta have in the past – before you can measure what effects there have been, you have to know what conditions were like before acid deposition began.

"One thing we don't really have is a good understanding of what's in clean air," says Dr. Allan H. Legge, a senior research scientist with the Kananaskis Centre for Environmental Research and the principal investigator with the BRP. "The bulk of the equipment on the market is built for compliance monitoring under the Clean Air Act which has nothing to do with clean air, only how much we're prepared to let air quality deteriorate."

The research program began with a worldwide review of published research on the causes and effects of acid deposition on various components of the ecosystem. An inventory of emissions of sulphur oxides and nitrogen oxides (the major contributors to acid deposition) for the province of Alberta was prepared, identifying 565 sources of sulphur oxides and 4,025 sources of nitrogen oxides.

The research team then set about trying to measure and describe Alberta's air quality by studying air entering the province in the prevailing westerly winds at a station on Fortress Mountain in Kananaskis Country, and by measuring air quality at two other stations, one west and the other east of Crossfield. Crossfield West was intended as a sampler of air modified by agricultural and general human activity. Crossfield East measured air that had also been modified by pollutants from the City of Calgary, Highway 2, and from a medium-sized gas plant. The results of this investigation are summarized in the accompanying chart.

> *"I think the project represents a pretty comprehensive start."*

The final component of the BRP was the creation of a computer model that would help predict where effects of acid deposition on water bodies, land and vegetation might be found, based on all the other information collected.

The conclusion researchers reached in their final report in 1988 was that:

"Regional scale impacts of acid deposition on crops, soils and surface waters today are not demonstrated and likely absent, with a slight reservation in the area of possible small impacts on alfalfa growth in a few areas. Large increases in average deposition levels, however, could affect alfalfa and similarly susceptible vegetation in areas that also experience high concentrations of ozone, and increased deposition of acidic and acidifying pollutants could acidify soils and surface waters in a few susceptible areas."

The ADRP had been ready to forge ahead with the study if the results had shown there were "regional scale impacts" after all but because the report said things were basically in good shape, the program stopped right there.

There were two findings in the report that raised eyebrows. They involve ozone and alfalfa.

The ozone problem seems to come from British Columbia and Washington State. Researchers expected incoming air at the Fortress Mountain station to be as free of pollutants as it could be – what some scientists call a "pristine" sample. In most measures of air quality, the breezes across Fortress Mountain are just that. But on more than 280 occasions over a two-year period, researchers measured concentrations of ozone that exceeded Alberta's ozone standard for one hour (see chart). On Fortress Mountain, they found levels of ozone consistent with the kind of readings you might find in Los Angeles.

Ozone in the upper atmosphere is beneficial to life on earth, acting as a filter of ultraviolet radiation. Ozone close to the ground, however, causes eye irritation, impaired lung function and damage to trees and crops.

The periods of high ozone concentrations in the air passing by Fortress Mountain were mirrored at the Crossfield stations, giving rise to concerns about the quality of air flowing into Alberta from the west. Some scientists, here and in British Columbia, contend that the ozone measured during these events had been drawn down from the stratosphere but the BRP scientists remain firm in their conviction that the source is from cities on the west coast, particularly the lower Fraser Valley which, according to Dr. Legge, has a major ozone problem.

Alfalfa yields northeast of Edmonton have posed a puzzle for the BRP researchers as well. Working from a model developed in Minnesota, researchers tried to predict alfalfa yields for three areas in the province: Crossfield, Barrhead and Cold Lake. Alfalfa was chosen for the study because it is particularly sensitive to sulphur dioxide (SO_2) effects. While the results were within the range predicted for the other two areas, yields for Barrhead were roughly half of the model values. Without further study, however, the research team could not reach conclusions about why yields in the area were so low. If it proves in future that such dramatically lowered yields can be traced to SO_2 pollution, the findings will be extremely significant for agriculture in areas near sources of SO_2 emissions such as natural gas processing facilities, oil sands plants and coal-fired power plants.

ALLAN LEGGE

Kananaskis Centre researcher Brian Fong at Fortress Mountain air quality trailer.

The Biophysical Research Program has been praised and condemned by reviewers, often in the same breath. The scientific community has expressed its praise for the program, on the whole, as a major accomplishment in setting baseline data on air quality for a geographic region.

The ECA's Mahaffy said, "I think the project represents a pretty comprehensive start. It's given us a pretty good map of Alberta – showing the parts where we should be concerned about locating, say, a sour gas plant and showing areas where more studies have to be done. In a way, it's remarkable these studies were done in Alberta. Very few studies of this scope have been made anywhere in the world."

Special praise has been given for new techniques the research team developed to measure dry deposition of acid-forming emissions.

On the other hand, critics point out that the study relied on models to predict effects rather than sending technicians into the field to measure them.

Because the study was looking for regional, long-term effects, the localized, short-term effects weren't studied, although most of the complaints from individuals fall into the latter category. Critics also claim the model used in the study could not predict effects on non-agricultural land. About two-thirds of the province is non-agricultural, most of it covered in forest. Large areas do not have soils as heavily buffered against the effects of acid deposition as are most of the province's agricultural land. As these non-agricultural areas contain the proposed sites for the province's pulp and paper development and also contain the province's oil sands developments and much of the sour gas development, these issues are of major concern.

"There's a lot of basic information we need to know in order to manage our environment properly and to tell us how much industrial development we're prepared to allow," says Legge. "We don't know what

ALLAN LEGGE

Crossfield East air quality monitoring trailer.

effect forestry development has on air quality both from mill emissions and from removing the forests. Knowing how little expertise there is in the province to study this would scare people."

Public Participation

One of the objectives of the ADRP had been "to encourage and include opportunities for public representation in the ADRP."

Special interest groups were represented at planning workshops early in the evolution of the ADRP and science advisory boards acknowledge that the concerns of the public had some influence on the research they proposed. The major public participation program of the ADRP came later in the process, though, after the research programs were in place. The members committee established a Public Advisory Board (PAB) to which it appointed members of special interest groups. When the program ended, the PAB consisted of members of Alberta health care associations, Christian Farmers Federation, Energy and Chemical Workers Union, Alberta Teachers' Association, Environment Council of Alberta, Alberta Aboriginal Peoples, the Alberta Society of Professional Biologists and the Association of Professional Engineers, Geologists and Geophysicists of Alberta.

The PAB produced its own final report, commenting on the findings of the various components of the program and making its own recommendations for further action (see next story on recommendations). The members committee saw the PAB as a source of public input and comment and as a means of informing the public of its activities. In its final report, the members committee said that "throughout the six years (of the program), the input of our Public Advisory Board was extremely valuable with respect to relevance of the scientific work."

Members committee co-chairman Findlay said: "the public involvement was unique because the public bought into it – not necessarily the research but the process – and government and industry listened to them."

The relationship was not a smooth one, however. There were two PABs during the course of the ADRP. The first, established shortly after the program began, elected a chairman who attended members committee meetings and served as a link between the two bodies. Relations became strained, however, over public criticisms of aspects of the ADRP by PAB members, particularly the PAB chairman, Martha Kostuch, a prominent environmental activist.

The controversy resulted in the dissolution of the PAB and for a period of two months or more the ADRP was without a public advisory board. When the PAB was reinstituted, it no longer had a chairman sitting in on members committee meetings but was assigned a paid moderator to coordinate PAB meetings and act as a liaison between the PAB and the members committee.

Despite the once stormy relations between the two groups, the members of the PAB wrote in their final report: "The expanded and reorganized Public Advisory Board has allowed for an interactive consultative process and, more importantly, one that has helped the ADRP members committee to produce better decisions. It is a proven, successful model for the future and should be used again."

Co-chairman Brushett said the program was "an educational process for the public – not just about the environment but about how to get involved and speak out about environmental issues."

Findlay said the program set a "very good standard for how industry, government and the public can work together." Needless to say, PAB members who didn't finish out the program have different opinions.

The ADRP attempted to keep the public informed of their activities through newsletters, annual reports, media relations and public meetings. The public meetings held in the Pincher Creek area in connection with the MDR were lively and were reported on throughout the province. The efforts and results of the BRP drew far less attention, leading Washington to lament that the press focused its attention on the MDR controversy and ignored the science going on in the ADRP, what she felt to be the "really sexy" news.

To overcome the lack of media attention to the findings of the ADRP, the program ran an advertisement in daily and weekly newspapers and newsmagazines in Alberta to announce the availability of the results and more than 2,000 requests for more information were prompted by these ads. Washington believes this was the first time such an advertising campaign had been mounted to announce the availability of scientific research results.

Still, ADRP scientists, PAB members and the decision makers who sat on the members committee express their disappointment that the ADRP's findings and recommendations didn't get more media and public attention. The ADRP was a lengthy and expensive project for industry and government to have collaborated on. That they got the job done together in the face of controversy and criticism is news in itself.

Eric Bailey is a freelance writer specializing in outdoor and interpretive writing, working from Lacombe.

Gail Helgason

MEETING THE CHALLENGE OF Regional Air Monitoring

Are we measuring the right thing in the wrong place?

When it comes to monitoring air quality, Alberta has what some experts call a "nice problem." Techniques used to monitor sulphur dioxide emissions near gas plants, for example, "usually don't get any detection level at all," says David McCoy, senior environmental specialist with Husky Oil in Calgary. The reason, he says, is that "the air in Alberta is basically pretty clean."

So what's the problem? Just this: While the province appears to enjoy relatively clean air compared with many parts of the world, some industry representatives, scientists and individuals are concerned that Alberta's routine air quality monitoring techniques are not sophisticated enough to allow good estimates of deposition. "Although Alberta may have relatively clean air at the present time, we must be vigilant for the future," the Public Advisory Board of the Acid Deposition Research Program (ADRP) stated in the prelude to its recommendations on air quality monitoring in 1989.

One of the board's key recommendations was that Alberta Environment should establish a long-term regional air-quality monitoring program for the entire province. "The program needs to include stations that monitor air entering the province, stations that monitor the air quality leaving the province and stations for identified sensitive areas – including those in the northern part of the province," the board said.

It also recommended that Alberta Environment and Environment Canada re-establish a baseline monitoring station at Fortress Mountain in Kananaskis Country west of Calgary. The recommendation grew out of a $5.3-million ADRP biophysics research program, designed to study the potential effects of acid deposition in Alberta. The study looked at two acid-forming gases: sulphur dioxide and nitrogen oxides. They can fall to earth in rain, snow, sleet or hail, a process known as wet depo-

The Fortress Mountain air quality monitoring trailer was set up to measure "pristine" mountain air but recorded high levels of ozone from B.C. and Washington state.

GOVERNMENT OF ALBERTA

Ken Smith of Alberta Environment's Environmental Protection Services

sition. Under dry deposition, they fall to earth and combine with surface moisture to form acids.

The study team, led by investigator Dr. Allan Legge of the University of Calgary's Kananaskis Centre for Environmental Research, established a monitoring station at Fortress Mountain to study the quality of air entering Alberta. Two other stations in the Crossfield area northwest of Calgary measured air quality near a gas plant and a major highway.

The study team concluded that the concentrations of acid-forming pollutants at ground level in Alberta – even in areas near highways, cities and industrial plants – are extremely low. The scientists were surprised, however, that the Fortress Mountain station detected ozone that appeared to have entered Alberta from British Columbia and the state of Washington. Over a two-year period, high ozone concentrations were observed at Fortress Mountain on more than 280 occasions. "This is the first time that the long-range transport of ozone has been observed in western Canada," Dr. Legge reported.

The ADRP's Science Advisory Board (SAB) said the results of the monitoring exercises generated a data base of air quality "unmatched elsewhere in the world." It rated the program as one of the most comprehensive studies of air pollution in the world. Despite these accolades, the Fortress Mountain station was dismantled after the ADRP completed its work. The provincial government has been studying follow-up action on the ADRP recommendations.

> *"We don't have a good idea of what the general air quality of the province is."*

At present, Alberta Environment polices the Clean Air Act through a system of point-source monitoring. Ambient concentrations of pollutants are measured, on an hourly basis, at more than 300 sites near industrial plants and urban areas. (Ambient refers to surrounding outdoor air or any unconfined portion of the atmosphere.)

The problem, says McCoy, is that these monitors may fail to detect abnormal levels of pollutants if the wind blows emissions in another direction. Moreover, the devices are not sensitive enough to pick up pollutants in the parts per billion range, which, for example, might be necessary to detect the long-range transport of ozone. McCoy, who was a member of the ADRP's biophysical technical research advisory council, thinks the solution is to eliminate point-source monitoring and to replace it with a system of regional air quality monitoring, as recommended by the ADRP's Public Advisory Board. "Perhaps for the same amount of money that is being spent on point-source monitoring, you could have something that is vastly more sophisticated," he says.

McCoy says regional monitoring means that sensors would be established at locations indicated by air quality models and would contain more sophisticated measuring instruments.

Ron Findlay of Calgary, industry co-chairman of the members committee of the

ADRP, is a strong proponent of the idea. "Regional monitoring gives you atmospheric conditions, where point-source doesn't. With regional monitoring, for example, you could find out if there is any pollution loading going on."

Dr. Legge, who oversaw the biophysics study, agrees. "What we essentially have now are air quality monitors looking at emissions at point-sources. We don't have a good idea of what the general air quality of the province is." Substances that could be detected using regional monitoring, he says, include greenhouse gases such as volatile organic compounds (VOCs). VOCs and nitrogen oxides react to form tropospheric ozone, which increase the atmospheric temperature (the greenhouse effect), and contribute to smog. Gases that Dr. Legge thinks should be monitored on a regional basis include sulphur dioxide, nitrous oxide, nitrous dioxide, hydrogen sulphide, carbon dioxide, carbon monoxide and ozone. He insists that while the biophysics study found low acid pollutant levels in Alberta, it is still important to monitor air quality entering the province through the Fortress Mountain station. "Not only should Fortress Mountain be put back in, but there should be regional-scale monitoring in other parts of the province. You can only make

ADRP Recommendations

Now what? After all those thousands of hours of research, what action has resulted from the recommendations of the Alberta Acid Deposition Research Program (ADRP)? The wide-ranging recommendations included calls for more research into air quality, human and animal health, and a review of possible commercial applications for the air-quality monitoring methods pioneered by the ADRP. Ken Smith says that 1989 was "basically used as a planning year."

By April 1990, Alberta Environment plans to start directing follow-up activities on some ADRP recommendations. The department has had an internal working group focusing on followup, including developing new management strategies for dry acid depositions in sensitive areas. Details of the followup are not complete, but "we've been working on it," says Smith. Another ADRP recommendation, which was referred to industry and Alberta Occupational Health and Safety, called for more research into the occupational health of workers in Alberta's sweet gas, sour gas and thermal plants. "There hasn't been much momentum to get into the occupational health part of it," says Linton Kulak, co-chairman of the human health committee for the ADRP, and director of health, safety and environment for Shell Canada Limited. He notes that the recommendation came at a time when oil companies were facing a downturn, and since then, they have been preoccupied with the effects of oil spills. One outgrowth of the ADRP recommendation, however, was the establishment of a network for hydrogen sulphide researchers. These scientists held a conference in Banff last June, entitled International Conference on Hydrogen Sulphide and Toxicity.

Another ADRP recommendation, for detailed veterinary health studies, has been referred to Alberta Agriculture. A seminar and workshop on acid deposition and its impact on animal health has since been held, and the proceedings are being published.

Overall, the amount of action taken to date on the ADRP recommendations has been disappointing to many of the individuals involved. "What we need now is someone to take a leadership role," says Paul Ramalingam, chairman of the pollution subcommittee of the Environment Council of Alberta, and a professor of biology at Canadian Union College at Lacombe. "There isn't any co-ordinated agency to look at where the recommendations are going."

Dr. Allan Legge, principal investigator on the Acid Deposition Research Program's biophysical study, says he's also disappointed at the lack of action on the recommendations. "We, as stewards of the planet, have an obligation to make sure we have as clean and as stable an environment as possible," he says. "It's been a big disappointment," echoes Susie Washington, who served as moderator for the ADRP's Public Advisory Board, and is president of Western Environment and Social Trends Inc. of Calgary. "I feel there was a clear mandate for action, and it never came."

wise management decisions with adequate information." Dr. Legge says, however, that cost is an issue. Re-establishing the three stations, including Fortress Mountain, could cost between $1 million and $2 million. Operating costs would be as much as $750,000 annually.

Peter Dickey of Calgary, manager of safety and environmental affairs for Shell Canada Limited, agrees that point-source monitoring has limited value in giving an overall picture of air quality in Alberta. But eliminating point-source monitoring would make it difficult to police industrial emissions. "As a citizen, I'm really interested in what I'm breathing. But I'm not sure how you determine who is doing what without some sort of point-source monitoring."

Howard Samoil, staff counsel at the Environmental Law Centre in Edmonton, says the idea requires more research. He's concerned that the lack of point-source data would make enforcement of pollution standards, including prosecutions, difficult.

While some scientists and other concerned individuals are becoming increasingly impatient to see action on the issue of regional air monitoring, there are some signs of activity. Randy Angle, head of the Atmospheric Dispersion Section, Air Quality Branch, Alberta Environment, says the department is working on an ADRP management plan that would involve more regional monitoring. Details are still being worked out. No indication exists, however, that point-source monitoring is about to be replaced by a regional system. "From an air quality monitoring and compliance perspective, the point-source monitoring is absolutely crucial for ensuring compliance with the terms and conditions of licences issued under the Clean Air Act," says Ken Smith, assistant deputy minister of Environmental Protection Services with Alberta Environment and co-chairman of the ADRP. The department is concerned, however, about the role of ambient monitoring in direct enforcement. "If you've got a monitoring station in the vicinity of a facility, or facilities, you may observe ambient readings on equipment there that are not directly attributable to a specific source, and that creates a legal difficulty with enforcement," says Smith. Although the department will continue to have point-source stations throughout the province, Smith says that the monitoring system could be improved by tying it in more directly with some of the current ambient monitoring done by industry as part of its licensing requirements. "In fact, discussions are under way, particularly with the oil and gas sector, on how we actually require industry to do ambient monitoring, to see if we can improve the data bases." On the Fortress Mountain issue, Smith points out that the ADRP itself was never intended to be a long-term air-quality initiative. Although Alberta Environment and Environment Canada reviewed whether the station should be kept open, neither felt ready to take it over.

Some scientists and other concerned individuals are becoming increasingly impatient to see action on the issue of regional air monitoring.

Since that time, some controversy has erupted in the scientific community over the measurements that were reached at Fortress Mountain. A provincial-federal task force is now reviewing those findings and is expected to report by the end of 1990. "It bears directly on whether the kind and nature of information that was produced there (at Fortress Mountain) is in fact useful from a long-term monitoring point of view," says Smith. "Until those technical experts have clarified their position, we're really not in a very good position to say if we think this should be continued." If the Fortress Mountain station were re-established, "Alberta would not necessarily be a key participant," Smith says. He believes the chief purpose might be to provide information useful to the international or national community. Dr. Legge believes that Alberta should not look at the issue of regional air quality in isolation. "The citizens of Alberta are members of the planetary community, and we're not doing our job."

Gail Helgason, co-author of three outdoor guidebooks on Alberta, is an Edmonton freelance writer.

Marian White

ACIDIFYING AIR POLLUTION

New Challenges for the '90s

Oilsands, heavy oil and pulp mill development will be sources of new emissions.

The mandate of the $5.3-million, 3.5-year ADRP biophysical research program is to determine whether, on a regional scale, Alberta's vegetation, soils and surface waters are suffering any ill effects from acidic or acidifying air pollution; and if not, when, where and under what conditions they may do so. The team published their findings for each of 10 Alberta emission regions.

> *The prospect of more oilsands and heavy oil development is of concern to scientists, government and citizens alike.*

Their news? Good and bad, both. With one exception (the alfalfa-growing area in the eastern part of Region 7, northwest of Edmonton), the scientists found it "extremely unlikely" that, except in the immediate vicinity of point sources, there is any impact at all. However, they warned, intensive industrialization and its attendant pollution could acidify soils and lakes in the acid-sensitive areas they identified, and damage crops and other vegetation.

The Alberta Research Council describes 23 per cent of Alberta's soils as highly and

30 per cent as moderately acid-sensitive. Some of the most sensitive are in the north where oilsands and pulp mill development is taking place.

Oilsands and Heavy Oil

Oilsands development is of great concern. Alberta has two such plants, Suncor and Syncrude at Fort McMurray among the coarse sandy or gravelly soils of Region 4. They are Alberta's top two sulphur dioxide pollution sources, jointly spewing out 445 tonnes/day because they burn high-sulphur oilsands coke.

Alberta's heavy oil (bitumen) in situ recovery plants numbered 14 by 1985, mostly around Cold Lake in Region 6, by the Saskatchewan border. Before 1985 they produced negligible sulphur dioxide because, "as world oil prices fell, many were mothballed," explains Bill McDonald of Alberta Environment air quality branch. Heavy oil plants produce much less sulphur dioxide than oilsands plants because they burn no coke.

Unlike heavy oil, oilsands production has steadily increased. As the latest Energy Resources Conservation Board annual report points out, "Oilsands (and heavy oils) are seen as the main source of a secure oil supply in the future." The Energy Resources Conservation Board has approved expansion of the slightly larger Syncrude plant and Suncor plans for a $200-million expansion of its plant.

The future of a third plant, the $4.1-billion OSLO, is in doubt following the recent pullout of federal government funding. Although intermediate in size between the other two, it would have less impact on air quality because the technology is more advanced, says McDonald. "Potentially, both emissions could be eight to 10 times below what comes out of Suncor or Syncrude." The prospect of more oilsands and heavy oil development is of concern to scientists, government and citizens alike, because of the prospect of increased acid deposition on the highly acid-sensitive soils found in the region. They are peats and coarse, sandy soils and, downwind, the most acid-sensitive areas of all: the scanty soils and bare Precambrian granite of the Canadian Shield, north of Lake Athabasca in Alberta and east into Saskatchewan. Such areas are highly vulnerable to acid damage.

Pulp Mill Development

Although oilsands and heavy oil pose a far greater threat of acid deposition, there is some concern about sulphur dioxide emissions from large kraft mills proposed for northern Alberta.

GOVERNMENT OF ALBERTA

Larry Turchenek (right)

Alberta's third pulp mill began operating in 1988, three more are under construction and a seventh is proposed by Alberta Pacific Forest Industries (Alpac). Two others are on the drawing board. In the ensuing controversy, environmental concerns have focused on forest management issues and the effects of mill effluent on water quality. Should we worry about acid emissions from these mills, too?

ADRP's conclusion does not help. An equivocal yes and no, it depends on two things: the amount of acidifying emissions the plants would produce, and the sensitivity of the receptor environment to acidification.

Pulp mills produce negligible nitrogen oxides, and the amount of sulphur dioxide emitted depends on the technology involved. Bob Beaty, acting head of Alberta Environment's air quality control branch, says: "The chemi-thermo-mechanical pulp (CTMP) mills basically don't emit sulphur dioxide at all. It's the kraft mills that are the problem." Three of the seven mills are CTMPs. Alberta's two oldest are kraft, "But even so," says Beaty, "their relative contribution is very small."

Beaty expects to see the new or proposed mills perform only marginally better than existing ones. The newest technology is already more than five years old and its environmental advantages relate chiefly to discharges to rivers, not the atmosphere. The new and proposed mills would triple the industry's tiny contribution to our acid-forming emissions.

Northern Air Quality

Another factor complicating the resolution of northern Alberta air-quality issues is this: while ADRP researchers reviewed the scientific literature for all Alberta, their three monitoring sites were all in Region 9. Hence no good northern baseline data exist.

One station, at Kananaskis's Fortress Mountain, monitored for background quality, supposedly pristine air entering Alberta. Some guess the northern air may be similar, because of the lack of widespread industrial development there, but concerned northerners disagree. Local environmentalists are demanding more information on northern background air quality. Westlock farmers are convinced their alfalfa is already affected by acid pollution arriving on winds from the Pacific coast. The ADRP Public Advisory Board recommended developing predictive baseline data for the acid-sensitive northern areas: a job still undone.

Southern Sour Gas Development

Industrial development continues in the south as well. A large, new sour gas plant is proposed for Caroline, west of Red Deer. The field's 85 billion cubic metres of sour gas is the biggest find in 20 years and the plant will be a significant source of sulphur dioxide emissions.

Standards

Even without conclusive information, the government has to set standards to control such pollution. It is the classic dilemma of having to make decisions in the face of scientific uncertainty that environmental managers live with all the time.

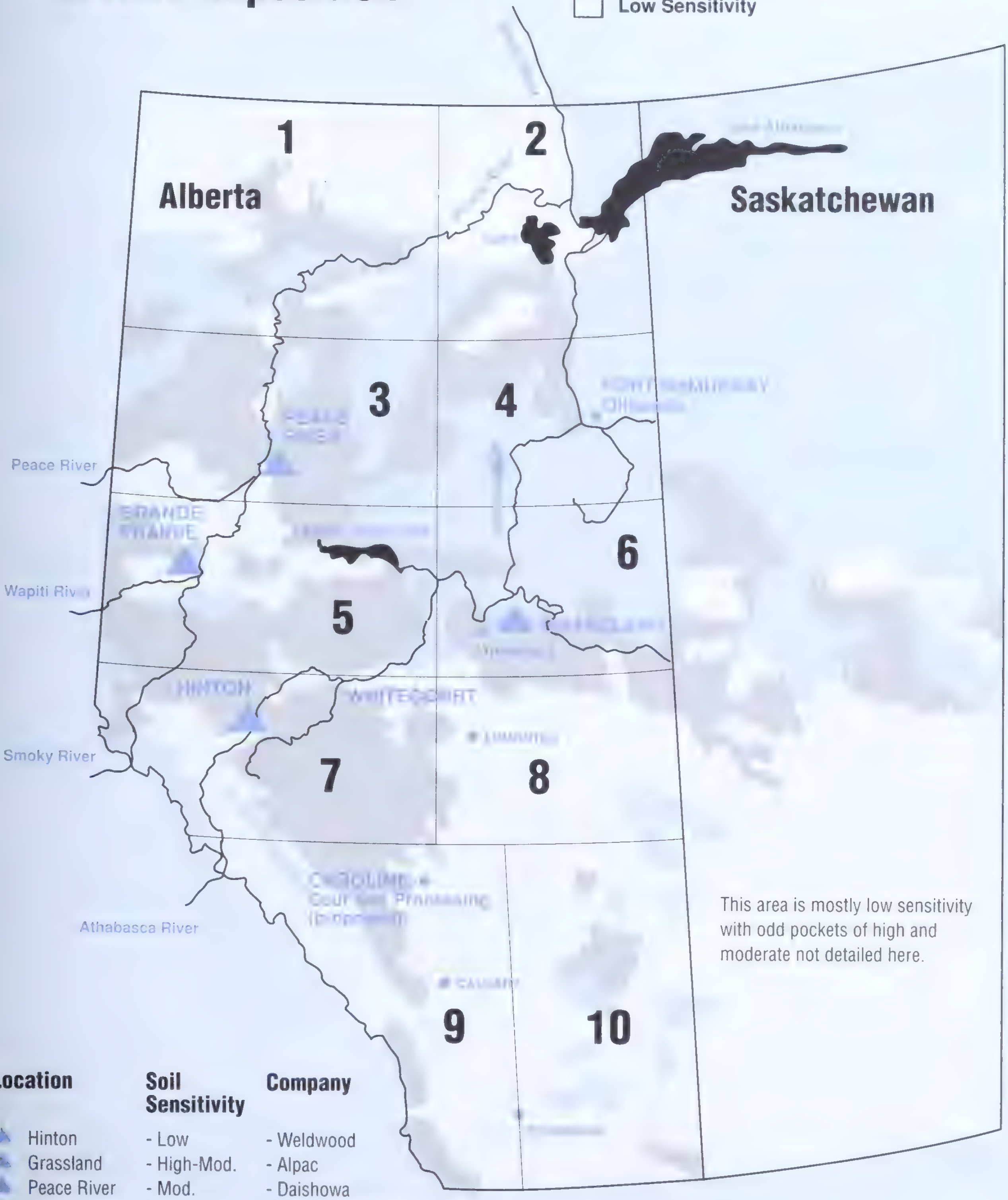
Alberta Environment senior manager Dr. Harby Sandhu chairs the Long-range Transport of Air Pollutants (LRTAP) Western and Northern Canada Committee. In 1980,

Sensitivity of Soil to Acid Deposition

☐ High Sensitivity

▨ Moderate Sensitivity

☐ Low Sensitivity



This area is mostly low sensitivity with odd pockets of high and moderate not detailed here.

Location	Soil Sensitivity	Company
▲ Hinton	- Low	- Weldwood
▲ Grassland	- High-Mod.	- Alpac
▲ Peace River	- Mod.	- Daishowa
▲ Grand Prairie	- Low	- Procter & Gamble

▲ = **Kraft Mill**

1 - 10
Emission Regions

LRTAP 1987

GRANT ELSTON

and Northern Canada Committee. In 1980, LRTAP set out to map the sensitivity of western soil and surface waters and specify target loadings for acid deposition – a maximum allowable deposition standard. "We wanted a scientifically defensible number," he says.

In eastern Canada, officials use a figure of 20 kilograms per hectare per year of sulphate in wet (rain and snow) deposition for moderately sensitive areas. But in the west, dry deposition is also a major factor. The problem is, you can't actually measure dry deposition, you have to theoretically model it.

On the prairies there's a lot of dust in the samples, from farming on our largely neutral and alkaline soils. We have to factor that (buffering) in. That means not only that we can't adopt the eastern figure, we can't even use the same kind of measurement, notes Alberta Environment environmental quality monitoring branch's Dave Trew. "Eastern deposition is hydrogen sulphate, that is, sulphuric acid. Ours is largely (non-acidic) calcium sulphate or ammonium sulphate. We need an entirely different way of expressing acid deposition."

By 1987, LRTAP research under the National Research Council environmental quality scientific criteria committee's watchful eye came up with a new figure: an "effective acidity" of 0.30 kilomole (300 grams) of hydrogen cations per hectare per year. But no one says that is definitive and neither it nor the eastern standard is being used in Alberta. Another recommendation is now in the works.

Conclusion

One purpose of the massive first-stage ADRP biophysical study was to pinpoint sensitive areas for further study. Stage 1 was never expected to produce definitive answers on regional-scale acidification problems. Even so, the scientists and environmentalists alike are quick to point out the severe limitations of Stage 1. Notes Randy Angle of Alberta Environment's air quality branch: "The computer model originated from Minnesota. It was never validated by field tests for applicability to Alberta."

No monitoring was done in the north where the most acid-sensitive soils are. And although originally intended, no effects on forest were modelled – even though the north is largely forest.

Scarce data, their complexity and the time and cost involved limit our knowledge, though the ADRP science and public committees have recommended further research. "Modelling is no substitute for in situ measurement," says Legge.

Marian White is a freelance writer and a partner in Fotolex Associates of Calgary.

Acid-sensitive Soils

Dr. Salim Abboud led the ADRP's soil-sensitivity risk-modelling team. He explains the three characteristics a soil must show to be acid-sensitive:

High Acidity

The more hydrogen cations (positively charged ions) there are proportionately freely available in the soil moisture, the more actively acid the soil. Active acidity is measured on the pH scale of 0 to 14 – neutral at 7 and increasingly alkaline above and acid below. Each unit drop represents a tenfold acid increase.

Research varies, but according to ADRP reckoning, acid deposition resulting in a soil pH of 5 is not a major disaster. Trees will grow at a pH of 5, but some crops, such as alfalfa, have trouble handling this pH level.

At 4, most calcium and magnesium cations – some of the soil's desirable nutrients – have been released by the soil, taken up by plants, and the surplus leached "down the sink," a precious food bank wasted. Instead, harmful metal cation release – notably the most abundant aluminum – now predominates, and at 3.6, the released aluminum becomes available in amounts toxic to plants.

Crops generally prefer a slightly acid soil of pH 5.5 and above. On the other hand, Alberta's forests have co-evolved with their environment since the Ice Age until they flourish today on pH 4 soils, says Larry Turchenek, ADRP soil-chemistry modeller.

Extremely Low Buffering Capacity

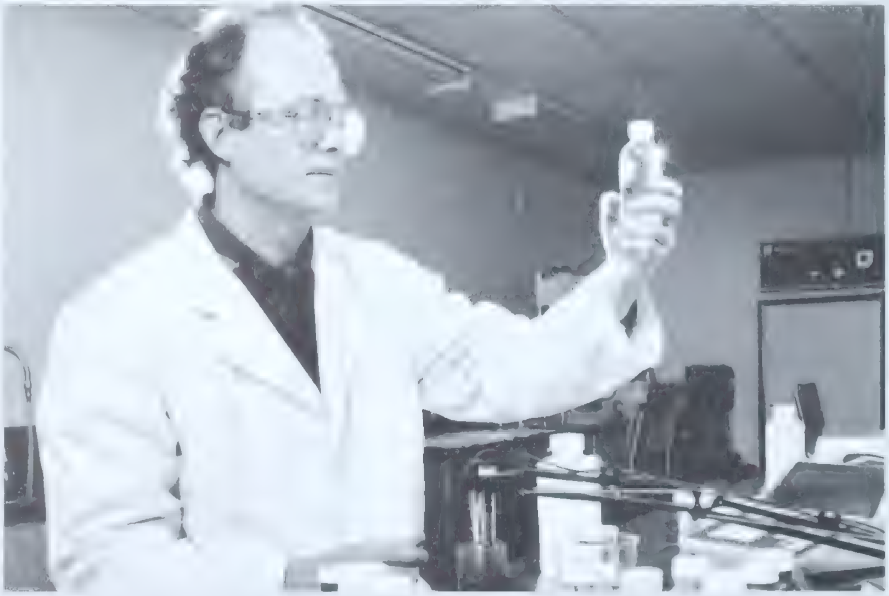
Fortunately, nature resists change. In a mineral soil, the buffering of increasing acidity is due to the soil's reserve capacity to immobilize surplus hydrogen ions by reaction to its clay and other mineral particles, out of harm's way.

As soils evolve over time, this reserve is used up naturally – a process that human activity can accelerate greatly. But the change is not even. When, like money in the bank, the buffering is all gone, the soil "goes broke" – it suddenly flips and becomes very acid.

Very Coarse Texture

Soils are made up of minerals and organic matter. The mineral portion is a mixture of particles ranging in size from the finest clay through silt to the coarsest sand and even gravel and stones. The coarser the mix, the more acid-sensitive the soil.

The organic peat soils are another class of acid-sensitive soils. The organic matter is, itself, very acid, and the soils make up only five per cent, the rest being water.



GOVERNMENT OF ALBERTA

Soil scientist John Ashworth of Northwest Labs testing for acidity.

John Dodd

TROUBLE IN
Blue Sky Country

Alberta's role in global air quality problems

ALLAN LEGGE

Alberta is second only to Ontario in production of nitrogen oxides, largely from gas plants.

> "We must think globally but act locally."
>
> *-Montreal Mayor Jean Dore, to opening ceremony, World Energy Congress Sept. 19, 1989*

The cool, fresh air blows in from the boreal forests of the Yukon and Northwest Territories and arches over the Rockies. Some Albertans think we can breathe easy. We all need to be concerned, but the well-known environmental insults to the atmosphere – acid rain, the ozone hole and the build-up of "greenhouse gases" – are mainly the results of emissions in eastern Canada, large portions of the U.S. and Europe, aren't they? That's not quite accurate, says Jerry Lack, director of the Standards and Approvals Division of Alberta Environment. Alberta may not have as many smokestacks, chimneys or vehicle exhaust pipes as Ontario or Quebec, but it is known as Canada's "energy-producing province." The emission problems caused by massive production of energy may sometimes be just as serious as problems caused by massive consumption of energy. Take nitrogen oxides (NO_x), which help to trap the sun's radiant energy within the earth's atmosphere, a phenomenon known as the greenhouse effect.

Alberta produced 447,000 tonnes of nitrogen oxides in 1985, the second highest level in Canada after Ontario. "One of the main reasons is that we generate a lot of nitrogen oxides in our energy production, mostly from gas plants, pipelines, power plants and the oilsands," says Lack. Or take carbon dioxide (CO_2), considered to be one of the prime causes of the greenhouse effect that may lead to global warming. Last year, Alberta carried out Canada's first carbon dioxide emissions inventory. The report by the Energy Conservation Branch of the Alberta Department of Energy found that this province produces about 20 per cent of all the energy-related carbon dioxide emissions in Canada, some 112 megatonnes a year. This means that energy-related emissions of carbon dioxide are the highest per capita of any province in Canada, the report says. It cites the high proportion of Alberta's electricity that is generated from coal. Burning coal produces large volumes of carbon dioxide as well as sulphur dioxide (SO_2).

Everyone knows that emissions have to be reduced. But how can this be done without seriously damaging the economy? How do we set limits? In Canada, the search for solutions involves thousands: economists, policy analysts, industrialists, scientists, technicians, communicators, environmental groups, political leaders, countless committees and subcommittees, plus the federal government, provincial governments, the United Nations and its member countries. "There are so many arms and legs that it can get pretty confusing, even for those involved day-to-day," says Wayne Draper of Environment Canada in Ottawa.

> *We really have only 10 years to make major changes. After that, it may be too late.*

Draper's own task illustrates the complexity of the approach that government and industry are taking. He's associated with a key group in this elaborate process – the federal-provincial Committee on the Long-Range Transport of Air Pollutants (LRTAP). It is working out national and regional strategies to control sulphur dioxide, nitrous oxides and volatile organic compounds and to draft a management plan for nitrogen oxides and volatile organic compounds (NO_x-VOC).

The complexity deepens. The LRTAP is divided into a Western and Northern Canada Program as well as a National Program. Each of the two programs has a minister's committee, a consultative committee, technical committee and technical subgroups. Various industry stakeholders have been consulted and working groups have been set up to look at everything from atmospheric modelling to biophysical and health effects, public education and much more. A "multi-stakeholder advisory committee," with representation from government, industry and environmental groups, will examine the draft plan, due to be released in March, and suggest revisions. The revised plan will be submitted in October to the Canadian Council of Ministers of the Environment. Janine Ferretti, executive director of Pollution Probe in Toronto, is a critic of what she calls "this endless consultation process." "The time for more studies has come and gone. We need action and the longer we defer that action, the more costly the solutions will be. We really have a 10-year grace period to make major changes in legislation, in government practices, in industry and in lifestyles. After that, it may be too late."

Walter Giles, associate deputy minister with the Ontario Minister of Environment, says the lengthy LRTAP consultation process is essential. He calls the whole scheme "highly ambitious" but adds: "I think we're going to make it." The danger, he says, is that this complexity will only produce a morass of contradictory or wishy-washy suggestions, rather than clear, well-thought-out guidelines. "You know what they say about the camel – that it's a horse drawn by a committee?" asks Giles. "Well, that's what we're determined to avoid." The LRTAP's camel-avoidance scheme is to have all the committee reports funnelled onto the desk of just one person – in this case Wayne Draper – who will write the draft plan, once he finishes reading all the material. "The reports are piling up in my office faster than I can read them," says Draper. Action on the whole range of major air pollutants is almost as complicated. Here's a breakdown:

Carbon Dioxide (CO_2)

Main Sources: Fossil fuels such as coal, oil and gas which release CO_2 when burned, plus biomass (wood, peat and other vegetation). Humans and other animals produce carbon dioxide with every breath. Canada contributes about two per cent of the world total.

Dangers: Prime greenhouse gas

Controls: No overall Canadian standards. The Conference on the Changing Atmosphere at Toronto in June 1988, recommended that countries such as Canada reduce emissions by 20 per cent of 1988 levels by the year 2005. But the federal-provincial Task Force on Energy and the Environment concluded last August that the suggested reduction would actually require a 46 per cent decrease in the CO_2 that Canada would otherwise produce in 2005 (taking growth and other factors into account). The task force called the recommendation "ambitious." It suggested "significant reductions in CO_2 emissions" and said the 20 per cent recommendation should be regarded "as an illustrative target rather than a formally-adopted goal."

Alberta perspective: Alberta, the other provinces and the federal government have agreed to pursue national and regional initiatives to reduce greenhouse gas emis-

Jerry Lack

sions. This includes measures to increase conservation and energy efficiency, energy research and development and public education. The government is also expected to set an example through wise use of energy.

The ERCB has launched a number of educational and information programs to encourage energy conservation in Alberta. Alberta prepared Canada's first inventory of CO_2 emissions. "Now that the figures are available, we can make some choices, choose priorities in dealing with problems and choose some answers," says Bill Schnitzler of the Alberta Energy Resources Conservation Board. He cautions that any action on carbon dioxide must be co-ordinated with action on other energy-related emissions such as nitrogen oxides and volatile organic compounds. "There could be a ripple effect. Fixing one could make another worse."

Direct effects of CO_2 reductions on Alberta: National and international moves to reduce emissions of greenhouse gases such as carbon dioxide would have both positive and negative effects on Alberta energy industries, according to a 1989 discussion paper prepared by the Alberta Oil Sands Technology and Research Authority. The Greenhouse Effect and the Alberta Fossil Fuels Industry report concludes that any co-ordinated attack on the greenhouse effect would need to involve:

- A concerted effort to discourage forest clearing
- A ban on virtually all uses of chlorofluorocarbons (CFCs)
- A staged reduction in fossil fuel use

> *Alberta has already made significant reductions in sulphur dioxide emissions.*

It says that a mandatory reduction in fossil fuel use would create strong pressure to phase out the use of coal for electric power generation.

Since natural gas only produces about half as much carbon dioxide per unit of combustion energy as coal, total carbon dioxide emissions could be reduced by substituting natural gas for coal or fuel oil wherever possible. This would, of course, benefit the natural gas industry and hurt the coal industry.

Walking to work saves energy and emissions.

What the Individual Can Do:

Energy conservation is the most effective way of reducing the amount of CO_2 in the earth's atmosphere, says Ian Burn, director of the Energy Conservation Branch of the Alberta Department of Energy. Dr. Harby Sandhu, a senior manager with Alberta Environment, says integrated action involving business, government and individuals is essential. "Since energy resources are depleting, overall energy conservation is the best way to cut production of carbon dioxide and to meet targets. People can really do something about this. Individuals have a responsibility to conserve energy, to recycle. It's something we can do immediately at minimum cost."

Sulphur Dioxide (SO_2)

Main Sources: Combustion of fossil fuels for energy production, such as burning of gasoline, coal and gas; gas processing plants, oilsands plants, production of electricity by coal-powered plants.

Dangers: Creates acid rain which harms forests, soils and water. Under certain circumstances it can have harmful effects on human health.

Controls: Canada signed the 1985 Helsinki Agreement sponsored by the United Nations Economic Commission for Europe (UNECE). It calls for a 30 per cent reduction in 1985 levels by 1993. Agreed-on target levels only affect the eastern provinces (where SO_2 emissions are higher). The western provinces are still discussing target levels for their areas. Across Canada, SO_2 emissions have declined by 800,000 tonnes from 1980 levels, about 40 per cent of the required reductions. The Clean Air Act provides guidelines for SO_2 emissions from new power plants

Alberta perspective: (See other articles in this issue for reports about the SO_2 inventory and studies looking into how SO_2 affects human health and the environment in the province.) This is an area where Alberta has already achieved significant reductions. SO_2 emissions in Alberta actually declined from an estimated 807,000 tonnes in 1972 to 488,000 in 1982 (today's figures are at about 600,000 tonnes). Lack says most of the reductions came from the natural gas processing industry. The ERCB has imposed strict controls on sulphur dioxide emissions from gas plants. Costly sulphur removal processes have been economically feasible for these plants because the sulphur recovered can be sold into strong international markets.

Coal-fired power plants are another major source. The Alberta plants are not required to use scrubbers to recover the SO_2 produced. Many Ontario plants use scrubbers. "The reason is that we have low-sulphur coal in Alberta," says Lack. "The Ontario coal has 10 to 20 times more sulphur. So we are able basically to achieve the same SO_2 emission rates without scrubbing as Ontario does with scrubbing."

Nitrogen Oxides (NO_x), Volatile Organic Compounds (VOCs) and Methane (CH_4)

Main sources: Combustion of fossil fuels, the use of agricultural fertilizers, gasoline byproducts and cleaning solvents. Most methane comes from natural sources such as decomposition of materials in wetlands, and from agriculture, including livestock.

GOVERNMENT OF ALBERTA

GOVERNMENT OF ALBERTA

Overall energy conservation is the best way to cut production of CO_2, says Dr. Harby Sandhu. Individuals can contribute by walking or taking the bus.

Dangers: These substances react to form tropospheric ozone,which contributes to the greenhouse effect. The oxides also contribute to photochemical smog. Methane is the second-largest contributor to the greenhouse effect next to carbon dioxide.

Controls: Canada has signed the 1988 agreement sponsored by the UNECE. It calls for maintaining 1987/88 levels of nitrous oxide emissions until 1994. The UNECE is now working on an agreement for volatile organic compounds. The provinces are assisting the federal government in preparing Canada's approach.

The ERCB in Alberta regulates natural-gas driven compressors to minimize NO_x emissions at their source. A management plan for NO_x and VOCs is being worked out through the federal-provincial committee on the Long Range Transport of Air Pollutants (LRTAP) following consultation with stakeholders. New federal standards for cars are designed to reduce hydrocarbon emissions to the proposed California standards, starting with 1994 models. Draper says the new NO_x and VOC guidelines will have a "strong prevention component." "This means that any significant new source of NO_x and VOCs developed anywhere in the country should have a good control technology built in. That's a primary component of the plan."

Alberta perspective: Alberta's high levels of NO_x (second highest in Canada) come mainly from the energy industry such as gas plants, pipelines, power plants and the oilsands. On the other hand, ground-level ozone averages in Alberta are well below Ontario, Quebec, the Maritimes and the greater Vancouver area. Alberta Transportation programs encourage conversion of vehicles to natural gas or purchase of vehicles with natural gas systems.

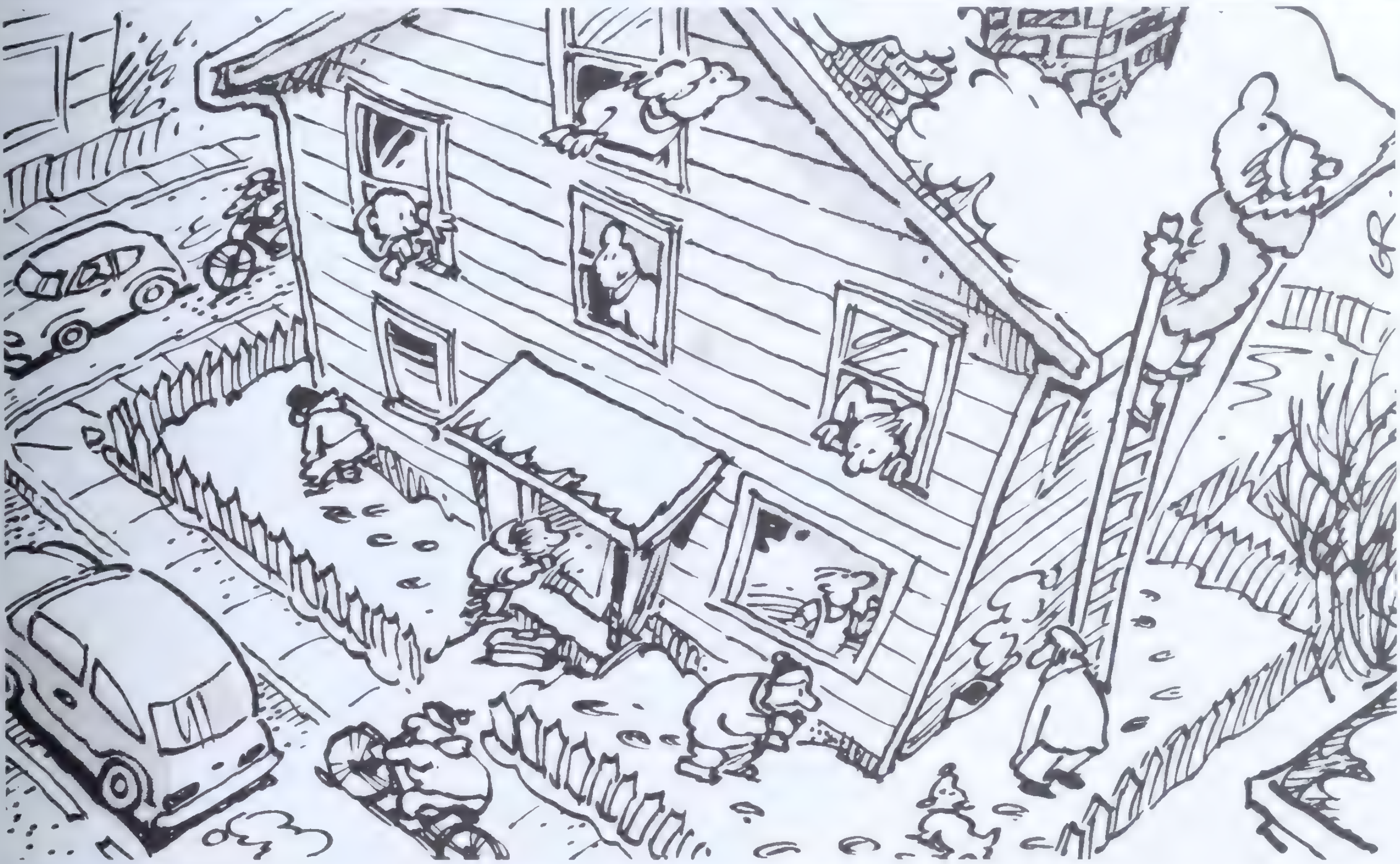
Rob Macintosh, executive director of the Pembina Institute, in Drayton Valley, says ordinary consumers can make a difference in reducing emissions of pollutants like NO_x and VOC. "The cost-effective solution is massive energy conservation. It's not going back to the Dark Ages, it's doing what countries like Japan have been doing for years: moving to high efficiency levels in the use of energy resources."

John Dodd, co-author of three outdoor guidebooks in Alberta, is an Edmonton freelance writer.

Linda Shapkin

HOW YOU CAN HELP TO KEEP
A Clean Wind Blowing

*What you do on the road and at home **does** make a difference.*



Like charity, atmospheric cleanup begins at home, especially in the furnace room and in the family car. Up to half the heat our furnaces produce is wasted. This tremendous loss of heat causes us to burn unnecessarily large amounts of fuel, all of which means putting even more pollution into the atmosphere.

You can turn to the heating system itself for a solution. If you are in the market for a new furnace, you might consider installing one of the new, super-efficient models. They have electronic ignitions rather than a constantly burning pilot light, which not only costs as much as $30 a year, but adds just that much more pollution to the air. Super-efficient furnaces are 95 to 98 per cent efficient, which means that all but three per cent of the heat they produce goes into the house, while ordinary gas forced-air furnaces are only about 50 per cent efficient. The rest of that heat disappears up the chimney.

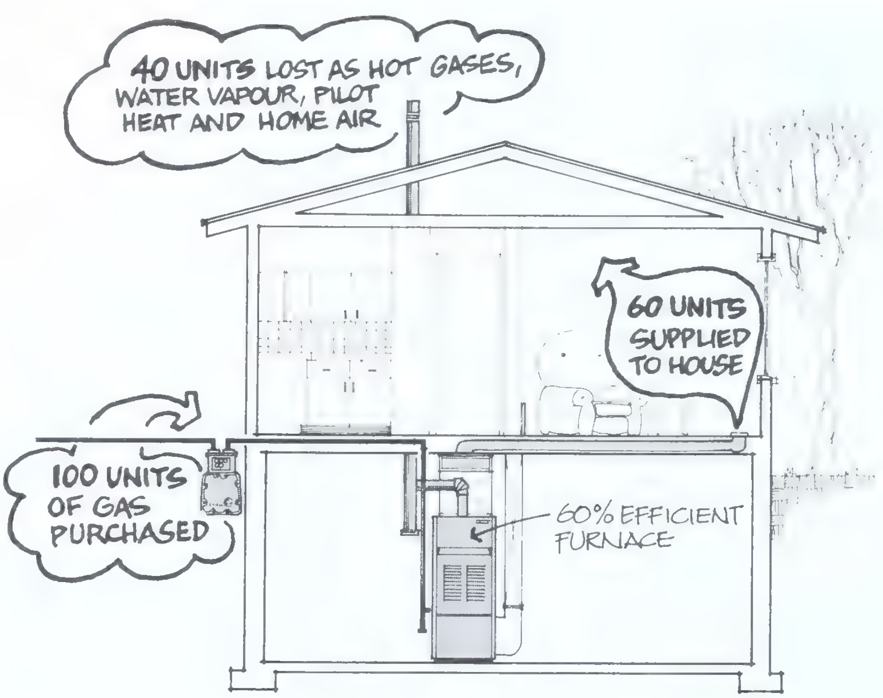
Make sure you're heating just the house and not the great outdoors.

Even if you can't replace the old furnace yet, you can help it run as efficiently as possible by maintaining it properly. A clean air filter, for instance allows heated air to circulate more freely.

Keeping the Heat In

You can also help keep your fuel consumption (and the bills) down by making sure you're heating just the house and not the great outdoors. An excessively leaky house can add as much as $150 a year to your fuel costs. Plugging those leaks should be your first order of business. But first you have to find them.

The best time to hunt for leaks is on a cold winter day. Second choice: a cool, windy day. Turn on the furnace and all exhaust fans, and move a burning incense stick or a


40 UNITS LOST AS HOT GASES, WATER VAPOUR, PILOT HEAT AND HOME AIR
60 UNITS SUPPLIED TO HOUSE
100 UNITS OF GAS PURCHASED
60% EFFICIENT FURNACE

smouldering piece of cotton string around the edges of doors and windows, electrical outlets, or any area where the outer envelope of your home has been pierced. Make a note of all drafts, and prepare to seal, seal, seal. Windows that leak air should be sealed with weatherstripping. Door frames should be caulked, and doors should be weatherstripped. Attic hatchways should be insulated on the attic side, and weatherstripped. Milk chutes can easily be filled with insulation and caulked or weatherstripped.

Exhaust fans, such as those above the stove, in the bathroom, or venting the clothes dryer, should be checked regularly for dust or lint build-up, and cleaned and adjusted so that the damper closes to a snug fit. If you have a fireplace, check the fit of its damper, too. You might consider making a decorative plug to put into the fireplace opening when it's not in use.

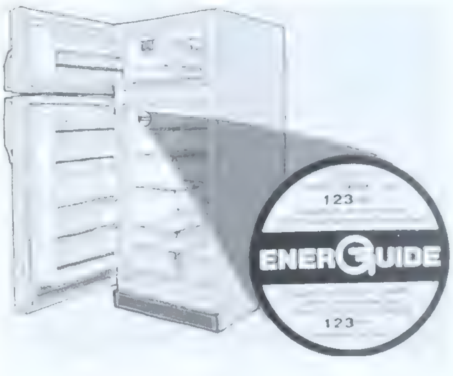
Put child safety plugs into unused electrical outlets on exterior walls, and use a fine bead of silicone caulking to seal around electrical switch plates and outlets.

Use caulking to seal along the sill (where the basement foundation joins the main floor), around joists and wherever water or gas pipes, conduits, ducts or vents enter the house.

Stop warm air from leaking into unused attic space by sealing around partitions, pipes, chimneys or vents that enter the attic. (Be sure to use heat resistant material around chimneys). Check to ensure that recessed ceiling lights and electrical boxes are properly sealed with a vapor barrier, which helps stop air flow.

Turn your water heater down to 50°C. Hotter water is dangerous and a waste of energy.

While you're up there, check the insulation. As much as 20 per cent of the heat your furnace produces can be lost through the ceiling, so a minimum standard of RSI 6 (R34) is recommended for Alberta homes. Walls should be insulated to at least RSI 2.1 (R12). Contrary to popular belief, the earth that surrounds your basement is an extremely poor insulator, while concrete basement walls are good heat conductors. Insulating the basement from the inside is easy if the interior walls have not been finished, but if they have, basements can also be effectively insulated from the exterior, although the job is harder and more expensive. Alberta Energy's Energy Efficiency Branch recommends insulating basements to an RSI value of 2.1 to 3.5 (R12 to R20) down the complete wall.



When shopping for new appliances, look for the Energuide rating.

Now that we're keeping all that heat in, might it be possible to turn down the thermostat a notch or two?

Energy-Thrifty Appliances

Many brands of new water heaters are superinsulated, but they can easily be insulated with a $25 to $30 specially made blanket. Or do it yourself with foil-faced fibreglass duct insulation. While you're at it, you might as well wrap all the hot water pipes with insulation, too. Then turn the thermostat on the tank down to 50°C. Water hotter than this is scalding and dangerous, particularly to children, as well as a waste of energy.

You can install inexpensive flow restricters on any hot water pipe leading into shower heads, sinks or appliances. True environmentalists not only wash their clothes in cold water, they refuse to use dishwashers at all, knowing those machines are greedy consumers of hot water. It's always a good idea to use any washing appliance only when there's a full load. When shopping for new appliances, look for the Energuide rating; it will tell you which fridge or stove or other appliance is most energy-efficient.

If you're planning to build a new home, think about passive and active solar heating, fewer California-style window walls and an overall smaller size that will require less heat.

Transportation Choices

Now that your energy-efficient home is returning lowered fuel bills and cleaner, healthier air, what about your car? Sooner or later, we all have to go to work, school, shopping or visiting.

The first question to ask yourself is: Do I really need to drive? Could I shop by phone or communicate by fax? Could I walk? Ride a bicycle? (They make snow tires for bikes, and the exercise is an added benefit. Just think how much more fun it is to refuel in the bakery, as opposed to the gas station.) Could I take the bus or use rapid transit? Could I have more fun and be stingy on the gas at the same time by driving a moped or a motorcycle? Could I move closer to my workplace, or better yet, work at home?

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Energy Efficiency Branch staff test automobiles for combustion efficiency.

If driving is absolutely necessary, save your errands and do them all at once in a chain trip, starting with the farthest destination first.

The way we drive makes a difference, too. Simply driving at slower speeds can mean substantial fuel savings and, therefore, cleaner air. Applying one foot to the gas pedal while resting the other foot on the brake creates drag that gobbles gas, spews exhaust into our atmospher and wears out brakes. Coast up to a red light; accelerate gently before a hill gets too steep; anticipate lane changes. Drive as smoothly as possible. Place an imaginary glass of water on the dashboard, and don't spill a drop. That sudden and well-advertised zero-to-sixty-in-one-minute getaway can chug-a-lug up to four times more fuel than a slower acceleration. It's a lot harder on the engine, too.

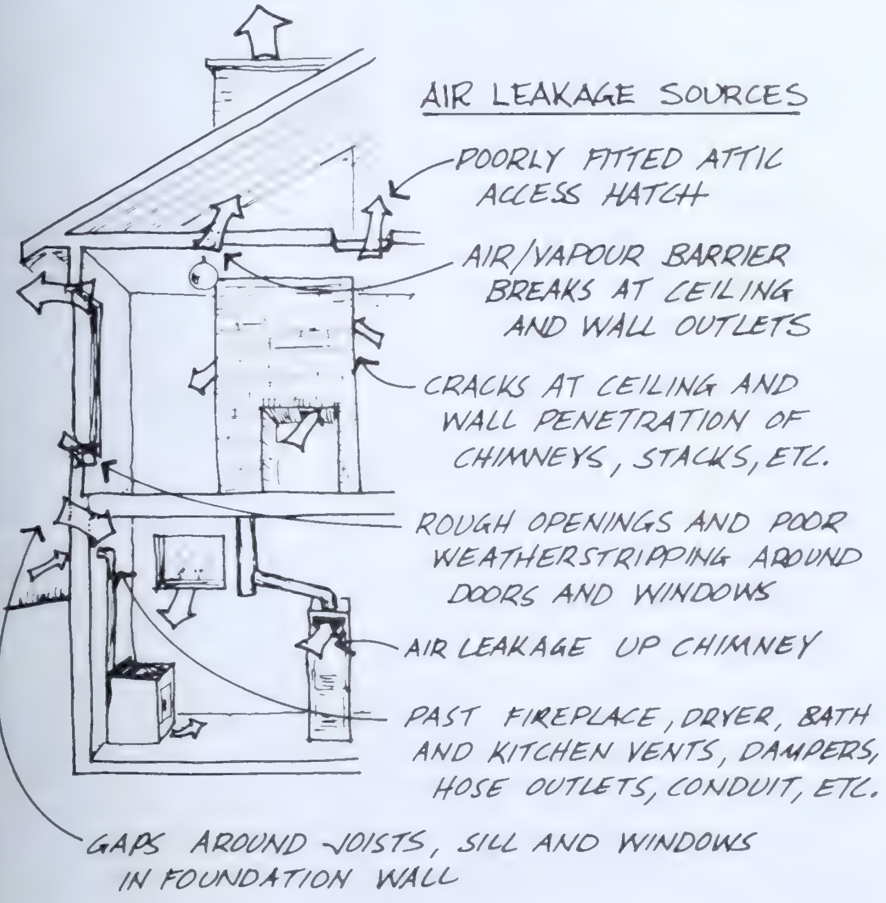
Driving with the windows open at highway speeds increases any vehicle's wind resistance and eats up fuel, so use the car's internal venting system instead. No car should be allowed to idle for longer than about two minutes, even in winter. Just drive slowly for the first few blocks, and the engine will gradually and safely warm up. On cold days, turn on the block heater two or three hours before you plan to use your vehicle. Using a timer for this beats crawling out of bed at 5 a.m. to flip the switch.

When buying a new car, look for the smallest and lightest vehicle that suits your needs. Lighter weight means less fuel burned to move the thing, and therefore, less air pollution. As a general rule, the more extraneous gadgets a car has, the heavier a gas guzzler it's going to be. Air conditioning is especially weighty. Furthermore, when it's turned on it gobbles up from three to five per cent more fuel. An aerodynamically designed vehicle will not only look good, it will have lowered wind resistance, too. Radial tires are four to five per cent more fuel efficient than bias-ply tires, manual transmissions are usually better than automatic, and five gears are better than four.

Properly maintaining your vehicle will not only increase its life expectancy, but will help reduce toxic emissions. Keep the tires properly inflated, remove snow tires as soon as possible and properly align and balance the wheels. Use the correct grade of oil to reduce engine friction, and check the cooling system regularly; today's engines are designed to run most efficiently at their proper operating temperatures. Always keep your vehicle well-tuned. Something as simple as a sticky choke can increase fuel consumption by 30 per cent.

These are all fairly simple, inexpensive, common-sense things that we can do to help keep the air clean. And if we all talk our friends into doing them too, and they make believers out of their friends, in no time at all our small contributions can be multiplied into a major force that will mean a clean wind blowing on us and our children.

Linda Shapkin is a Calgary freelance writer.


AIR LEAKAGE SOURCES
POORLY FITTED ATTIC ACCESS HATCH
AIR/VAPOUR BARRIER BREAKS AT CEILING AND WALL OUTLETS
CRACKS AT CEILING AND WALL PENETRATION OF CHIMNEYS, STACKS, ETC.
ROUGH OPENINGS AND POOR WEATHERSTRIPPING AROUND DOORS AND WINDOWS
AIR LEAKAGE UP CHIMNEY
PAST FIREPLACE, DRYER, BATH AND KITCHEN VENTS, DAMPERS, HOSE OUTLETS, CONDUIT, ETC.
GAPS AROUND JOISTS, SILL AND WINDOWS IN FOUNDATION WALL

ILLUSTRATIONS ALBERTA ENERGY'S ENERGY EFFICIENCY BRANCH

VIEWPOINT by Harby Sandhu

Uncertainty in Environmental Information and Decision Making

Environmental issues rank very high on the public's minds these days. We are passing through an historic transitional period in which awareness of the conflict between human activities and environmental constraints is exploding. During the past two centuries the human race achieved the ability to alter its environment on a global scale. Needless to say, human activity affects our total environment or its components: the atmosphere, hydrosphere or biosphere. Issues like global warming, ozone depletion, environmentally sustainable development and acid rain, now at the front and centre of attention of many scientists and policy makers, are just a few of the interrelated environmental problems we face today, and will continue to face in the 1990s and in the 21st century.

The air we breathe is a precious global resource. This resource seems unlimited, but the feeling of a boundless volume of air is deceptive. Many substances emitted from man-made and natural sources are involved in chemical reactions in the atmosphere, and many of the chemical changes in the laboratory of the sky are of great importance to us. The difference between the "natural" state of the atmosphere and today's air pollution situation is both one of quantity and of quality. It is the quantities and qualities of the ingredients added that determine the strength and taste of the atmospheric pollution. In other words, the human activities over the last two centuries have changed the "chemical personality" of the atmosphere. What is needed now is a global clean air strategy and worldwide commitment to protect the atmosphere.

When the issues are as complex as are global warming and climate change, and the existing scientific information base so meagre and uncertain, the room for opinions about the impacts on the environment can range widely. For example, statements like: "the greenhouse effect killed at least one million people in the Third World in 1988"; and "every waste of energy is an act of murder in the Third World" have recently been attributed to French agronomist Rene Dumont. On the other hand, some individuals do not even believe that global warming exists or will take place! Scientifically speaking, a strong body of evidence points to the probability of global warming, however, conclusive data on the issue are not yet obtainable. Consequently, although there is a wide consensus among experts that global warming seems imminent, this view does not have the unanimous support of the international scientific community.

For making sound policy decisions we need scientific facts or evidence. For complex issues like global warming it becomes nearly impossible to obtain facts in the time needed by policy makers to make decisions. Creation of "scientific consensus" is the only way to proceed. One must realize, however, that scientific truth is established not by consensus, but by solid evidence. In the case of global warming, evidence is gathered in the form of monitoring results and scientific modelling. Both results have large scientific uncertainties associated with them at the present time, and we may never obtain all the scientific facts needed to manage nature in the long run.

Given the state of knowledge, then what is the best way to proceed for making policy decisions at the international level? A two-pronged approach is needed. First, the decision makers must accept the "scientific consensus" as a basis for their interim actions, and make scientifically based conscious decisions after consultation with public and industry. Second, steps must be taken to simultaneously accelerate and enrich existing research programs or undertake new environmental research that will generate the needed evidence.

Of all the four issues mentioned in the first paragraph, acid rain is perhaps technically the simplest. It is now clear that emissions of sulphur dioxide and oxides of nitrogen are the major contributors to this phenomenon in Europe and in eastern portions of Canada and the United States. The chemical processes responsible for the transformation of sulphur and nitrogen in the atmosphere are relatively well understood, as is the significance of long-range transport. There is little doubt that acid precipitation, by leaching toxic metals from soils, has a negative impact on aquatic life forms in sensitive water systems, and there may be additional undesirable impacts on vegetation.

From the national perspective, the acid rain issue is quite different in the eastern and western regions of Canada. Western and northern Canada do not experience high levels of wet sulphate deposition over widespread areas. Both the science and control methods have focused on a more localized scale, while recognizing the regional contribution of emissions to the global background. Considering the sparse nature of scientific information collected even on this relatively simple issue of acid deposition, climate change presents quite a contrast.

The governments of the four western provinces, the Northwest Territories and Canada contacted the National Research Council of Canada, one of the most scientifically respected organizations in the country, to review the existing scientific information base and provide guidance for setting target loading or ambient acid deposition standards. The Associate Committee for Scientific Criteria on Environmental Quality of the National Research Council, (of which I was a member), supervised a study on this subject. The report released in 1987 recommended that two complementary strategies be adopted simultaneously:
(1) immediate development of interim target loadings for sensitive ecosystems and
(2) initiation of needed environmental research for obtaining additional scientific facts to review the interim standard. This approach was accepted by the participating governments and a task force was created to develop interim target loadings for acidic deposition.

The current trend in government and industry is to reduce wastes and minimize emissions at the source using the best available technology that is economically achievable. However, many individuals in our society expect that environmental protection agencies should ensure zero risk to the environment with no accidents. Such expectations are not realistic. Senior environmental managers consider socioeconomic aspects as well as assimilative capacities of receiver systems in setting protection standards. The lack of scientific information on crucial environmental issues demands that we continue to create scientific consensus and make common-sense decisions. This would include consultation with the public, to achieve environmentally sustainable development, which may mean lifestyle changes. At the same time, a strong commitment to investments in interdisciplinary and integrated environmental research and monitoring is needed to obtain scientific evidence and baseline information. As environmental research is costly, co-operative funding by industry, various levels of governments and other interested parties should be promoted.

Globally, huge sums of money, in the range of billions or trillions of dollars, are needed to eliminate or minimize atmospheric emissions. This magnitude of expenditure is bound to affect the economic systems of many nations drastically, especially developing and underdeveloped countries. Given the large uncertainty in the available scientific environmental information on major issues like global warming, policy makers' reluctance to rush into making quick decisions is justified. On the other hand, doing nothing to reduce or stabilize emissions is not acceptable either.

An atmospheric scientist by education, Dr. Harby Sandhu is a senior manager in the Corporate and Strategic Management Division of Alberta Environment. He is a member of the Canadian Climate Program Planning Board and represents Alberta on federal/provincial committees for the Long-range Transport of Air Pollutants in Canada.

VIEWPOINT *by Allan H. Legge*

The Atmosphere and the Future

We must clean up our evironment and we must start now. We must recognize and accept that it will not be cheap to accomplish this task and that it will not be done overnight. We must finish the decade of the 1990s with a new proactive environmental ethic. The native peoples of Canada have been trying to tell us for decades that we must live in harmony with our environment and not against it. It is time that we listened and heard the wisdom of their words.

The nature and scale of environmental air quality issues have changed greatly over the past 30 years as our environmental awareness of the consequences of deteriorating air quality has expanded and evolved. At first our concerns were focused on the effects of emissions from point sources of air pollution on the local environment surrounding these sources. These concerns were largely responsible for bringing about the increased awareness of the deterioration of the terrestrial environment by human activities in the late 1960s and early 1970s and the demands by the public for action.

The Clean Air Act was one of the legislative responses and was enacted in large part to provide a legal mechanism to control emissions from point sources and urban centres. Air quality monitoring was required to ensure compliance with the air quality objectives of the Clean Air Act.

During the last decade our concern and focus shifted to the regional scale environmental effects of acidic wet and dry deposition and the long-range transport of air pollution. These concerns reflected the recognition that multiple point sources, when combined with emissions from cities and unfavourable meteorology, could alter the air quality of large areas and could have a negative environmental impact such as has been found in eastern North America and Europe. Clearly, compliance with environmental legislation has not meant environmental protection.

We are now confronted with the issue of global atmospheric chemical and climatic change. Although the local and regional scale issues still exist and are still important, and must continued to be addressed, this global issue has emerged as the single most important environmental problem of the 1990s because of the potential negative consequences for all of humanity and not just Alberta or Canada. The potential exists for global warming and climatic change. Possible manifestations include an enhancement of the greenhouse effect due to increasing concentrations of such gases as $C0_2$, CH_4, N_20, and CFCs (chlorofluorocarbons) in the atmosphere. There is also the potential for an increased incidence of skin cancer caused by ultraviolet radiation reaching the earth's surface due to stratospheric ozone depletion.

It is clear that as our environmental awareness of air quality issues has grown, the complexity and magnitude of these issues has also increased. We recognize that we are the cause of the problems, but we have not approached these issues from the right perspective. Historically, we have reacted to environmental issues after they have arisen rather than preventing them in the first place. We are simply addressing yesterday's problems today in a piecemeal fashion with little or no thought for the future. Our environmental legislation is not bad; it is simply shortsighted.

Alberta is not isolated from the rest of the world – it can and will be affected by global atmospheric and climatic change. As a member of the world community, we must do our part not only by recognizing and quantifying our chemical contributions to the atmosphere but by reducing and minimizing them. We can do this as a society through reduced energy consumption and increased energy efficiency coupled with a continually updated inventory of our own chemical emissions to the atmosphere. Additionally, we must have a comprehensive high-calibre air chemistry monitoring network to characterize and quantify the changing air chemistry and to monitor our progress. This network could be tied into other similar networks in other jurisdictions to allow national and international information exchange and co-operation, and to ensure that our collective actions are making a difference. This will provide the long-term data and information base necessary to make wise and effective environmentally sustainable management decisions.

We must reverse our perceptions of the atmosphere as a limitless waste dump and learn from our past environmental mistakes. Our current concept of economic diversification and economic viability must be more than simply dollars. It must include and be linked to environmental viability. Sustainable development must mean long-term environmentally safe development.

Dr. Allan H. Legge is a senior research scientist with the Kananaskis Centre for Environmental Research and the principal investigator with the BRP.

LETTERS

Scouts are Environmentalists, Too

Dear Editor:

I have recently read the December issue of *Environment Views* and I would like to congratulate the magazine on its general direction towards recruiting the youth of Alberta into environmental awareness. If there is to be a quality life for the Albertans of tomorrow, a concerned effort must be made now.

One concern I have with the magazine is that it failed to recognize one of the major resources for environmental education of youth in this province and that is the scouting movement. Scouts Canada has always stressed environmental awareness in its Youth programs. I would like to refer you to the "Trees For Canada" program which is one of the many environmental programs which are part of our organization.

Scouts Canada has been a leader in this area for many years and has been "user-friendly" to the environment and the outdoors long before it became a concern of government and other groups.

Our efforts and experience in working with youth is well recognized. Many new youth groups, such as the present Junior Forest Wardens have recognized this and have incorporated the ideas and skills developed by the Scouts into their programs. Outdoor Education programs run by many of the schools in the province are utilizing the ideas and techniques which have been part of Scouting for decades.

Perhaps one thing that you and your readers do not recognize is that scouting is a self-funding program. It does not receive the thousands of dollars of government support that programs like Junior Forest Wardens receive. If for this reason alone, the skills and efforts of our volunteer leaders and youth members should be recognized. To this end, I would be pleased to meet with you at any time to outline our efforts. Perhaps there would be an opportunity for the magazine to run a special feature on Scouting and the environment.

I noticed that the editorial board of the magazine does not have a representative of a major youth group. May I suggest that a member of Scouting be considered for appointment to the board. This I feel would give the board a perspective it does not have at this time.

I have taken the liberty to enclose a recent copy of our Leader magazine which will give you an insight into some of the activities scouts are doing to give youth an awareness of their responsibilities toward the environment.

I will look forward to further contacts with members of your staff in hopes of enhancing the environmental awareness of the Albertan youth.

Yours truly,
Jim Nichols
Regional Commissioner,
Northern Alberta Region,
Scouts Canada

Worthwhile Reading

Dear Editor:

I read with great interest the December issue of *Environment Views*. I would like to receive Environment Views on a regular basis, and would appreciate having my name added to the mailing list. Congratulations on producing such a worthwhile production.
Sincerely,

Eric Garrison
Ottawa

How Much Timber are we Giving Away?

Dear Editor:

First of all I'd like to congratulate you on putting out a relatively bias-free magazine. This is especially notable since it is government funded.

In the September issue you are getting a little closer to home and I detect a few more omissions. For example, I really expected some comment on exactly how many board feet/acres of timber would be converted to pulp in a year now that seven mills will soon be operating. Just how, given the growth rate of these trees (which is predicted to change as our climate changes) are we going to maintain enough boreal forest so that we do not get massive rainfall changes on top of other weather pattern shifts?

The timber consumption will be unprecedented and astronomical in proportion. A recent edition of the Forestry journal explored some of the things that might happen to tree growth under increased $C0_2$ and ozone depleted conditions. The problem is that,so far, speculation is all there is to make judgements with.

Does our government have the right to play roulette with our future? Claire Stirling (who did an excellent job, by the way) pointed out that the health of Prince George residents is already below the standard for the rest of the province. Shouldn't the government take that as a call for caution if nothing else?

As Claire and Gail did note, the people of this province have very little input as to whether or not they have to endure a certain industry in their area. All they can do is voice an opinion on a few minor points. This has got to change. If it doesn't, the accomplishments of the International Committee will be no more than a big joke and any megacorporation with enough "bucks" can buy its way into Alberta and, for a price, pollute our environment while lining its corporate pockets.

As an exercise in futility, I plan to write a letter to the Environment Minister when I finish this one. Your articles (March and June) on Environmentally Friendly Products and Recycling have prompted me to enquire just what assistance the government is considering to help people make choices concerning what to buy or whether to start a recycling business.

Back to the boreal forest. Every day there is some article or T.V. program calling attention to the decimation of the Brazilian Rain Forest and the effect this will have on the environment. Yet our boreal forest is just as ecologically fragile – if not more so due to the colder climate and slower growth rate associated with reduced growing seasons. I'm not against progress, only wanton destruction for immediate profit.

Yours truly,
Dorene A. Rew
Rocky Mountain House

Of Course, We Agree

Dear Editor:

I wish to subscribe to *Environment Views*. I have heard that your magazine is one of the best in Canada for keeping people informed on environmental issues.

Thank you.
D. Cornelius
Regina

Shannon Terrace Environmental Centre

Dear Editor:

A major contributor to training Tomorrow's Environmentalists (Vol. 12) in Calgary, is the unfortunately unmentioned Shannon Terrace Environmental Education Centre in Fish Creek Provincial Park. Last year 14,336 school children from ECS to Grade 7 used the wide variety of full and half-day teacher-conducted programs offered at the Centre. As you can see from the attached "Explore" program calendar there is a diverse selection of environmental education programming from language arts to sensory awareness. The centre is extremely popular and we are very proud of the excellent services we offer. A typical reaction of researchers in this field that visit our centre is one of pleased amazement at the quality of the exhibits, the facility and the programs, all run by one coordinator – Val Street and a part-time janitor! The Shannon Terrace Environmental Education Centre has been in existence since 1983 and while Calgary teachers use this facility a lot – not many people in Alberta seem to be aware of this highly efficient, high-quality environmental educational resource. We would appreciate some recognition of the facility and the work being done. For more information contact: Val Street, E.E. Coordinator, Fish Creek Provincial Park
Thank you.

Sincerely,
M. Hamill,
Park Visitor Services Supervisor,
Calgary

Environment Views a Stimulating Discussion

Dear Editor:

When I picked up the December issue of your magazine I was overwhelmed by the immediate relevance of the articles to myself, as someone who wants to know what is being done to and for our environment, what could be done, and how others feel about such actions. Reading *Environment Views* is like being involved in a stimulating discussion of any heartfelt topic – one comes away feeling energized, challenged, with convictions strengthened and urging one to action, or with tantalizing new lights in which to reexamine familiar ideas.
I shared one such idea with Dr. David Schindler, who in the December issue expressed a view that "broadly based ecological education" by which children are taught to feel part of the environment is urgently needed, and that we are now sadly "far from this ideal". However a hopeful light was shone upon my cynical outlook by your coverage of the excellent efforts of teachers, parents, and youths themselves to indeed foster a love of our environment and act upon that love to preserve what is so magnificent, so precious, and yet so very fragile.
Thank-you, *Environment Views*, for showing me how it can be done.

Sincerely,
Suzanne Paproski
Edmonton

Environmental Awareness Needed

Dear Editor:

The December 1989 issue of *Environment Views* effectively highlighted several key points about environmental education in Alberta. One of the most disheartening points, to me, was the students' apparent lack of faith in achieving environmentally sustainable development. This, and their distrust of industries' environmental integrity, points out the need for industry to become much more involved in environmental awareness. Many companies/industries in Alberta have developed very effective environmental management programs. Until more people are made aware of such programs, negative attitudes and environmental "under-achievement" will prevail. For positive results to be achieved, a positive attitude should be fostered. Congratulations to Environment Views' staff for their efforts in producing a very effective, and fair, environmental publication.

Sincerely,
Curtis Brinker
Edson

Future Resource Manager

Dear Editor:

I very much enjoy reading your magazine *Environment Views*, and am currently enrolled in a course at university entitled "The Environment and Natural Resource Management". The articles in your publication are very informative and thought-provoking and for these reasons I would like to be included on your mailing list .

Sincerely,
Bava Wadhwa
Calgary

Buying Recycled Paper Is Worth It

Dear Editor:

It is great to see people sending their newspapers to be recycled. However, it won't do any good unless we also USE recycled products. In the U.S., recycling mills are shutting down their de-inking facilities because consumers have not created enough demand for recycled paper. To my knowledge, there are no mills in Canada which produce fine paper from post-consumer materials. As individuals we can:

- Buy and use recycled paper products.
- Pressure our government (a big paper consumer) to use recycled paper.
- Push for legislation that requires newspapers to use paper with a significant recycled content.
- Ask for legislation that requires pulp mills to produce paper in an environmentally friendly way.

The resulting higher paper prices would more accurately reflect the real cost, and would make it easier for recycled paper mills to compete. Be willing to pay more for environmentally friendly products. If it costs more to manufacture a product without harming the earth, then we must be willing to pick up the tab.
I quote from the Western Canada Wilderness Committee catalogue:
"By using these products you are doing more than saving trees, you are adding your voice to thousands of other Canadians who believe that Canada needs its own mills to process post-consumer paper into recycled paper products."

Sincerely,
Sigrid Fritz
Stony Plain, AB

BOOK REVIEW *by John Lilley*

Ozone Crisis
– The 15-Year Evolution of a Sudden Global Emergency

by Sharon L. Roan. Wiley Science Editions.
John Wiley and Sons Canada Limited, Toronto.
267 p. cloth. $24.95.

By now everyone has heard of CFCs and the ozone layer. But it hasn't always been that way. As the book's subtitle indicates, concern about the ozone layer has been a matter of wait, wait and hurry up as bureaucrats, politicians and industry officials delayed action until concrete evidence of damage was in hand.

The book provides an interesting account of the evolution of our understanding of the impact of chlorines and other halogens on the earth's stratospheric ozone layer. It covers 15 years from December 1974, when California chemists F. Sherwood Rowland and Mario Molina discovered that chlorofluorcarbons could rise slowly to the stratosphere and destroy the ozone layer, to August 1, 1988, when the U.S. Environmental Protection Agency ordered domestic regulations on CFCs that mirrored the 1987 Montreal Protocol. It is a history of action and inaction to protect the ozone layer.

Sometimes, the book gives a little too much detail. Nevertheless, it is worthwhile reading for any scientist whose work takes her or him across the invisible boundary between research and policy development. Anyone concerned about acid rain, climate change, water quality, in fact any environmental issue that requires scientific input into policy decisions, would be wise to read this book. It presents, in no uncertain terms, the conflicts that arise when science threatens established industry. How do politicians and bureaucrats make decisions that balance between environmental risk and economic reward? How much does scientific opinion matter in the upper echelons of decision making?

But read this book when you are in an optimistic mood. Otherwise it is a somewhat depressing story of 15 years of struggle to get politicians to act on the basis of scientific theory and of industry's unwillingness to change despite increasingly damning evidence that their products could be the major contributors to ozone depletion. Change seems to come only if it offers a market advantage. Scientific uncertainties contributed to the delay but perhaps more influential were the political and economic realities. Substitutes for CFCs would be expensive. As Roan puts it: Rowland and Molina were naive. "They were to discover that billions in profits would outweigh a potential environmental problem whose onset and magnitude were unknown."

Without agreement on the severity of ozone depletion, manufacturers could persuade lawmakers that it was premature to implement regulations. As support for the theory broadened, so did a fierce counterattack from the CFC manufacturing industry and the users of CFCs. It would not be until 1988, when scientists confirmed that up to three per cent of the ozone layer over the Northern Hemisphere had been destroyed, that CFC manufacturers would agree to a phased reduction in most CFC production. By then, as in 1977 when the use of CFCs as aerosol propellants was limited, substitutes for many CFCs had been developed and the economic hardship of the phaseout would be minimal. "Suddenly, it seemed as if industry held a certain pride – if not a distinct marketing advantage – in promoting products that were safe for the environment."

If you are feeling optimistic, the book becomes a tale of good science victorious in the end. The theory was clear but there was no proof. Could steps to control the use of CFCs be taken on the faith of theory? The unflagging efforts of Molina, Rowland and others to convince politicians and industry officials that CFCs cause the breakdown of ozone ultimately would win out.

Also evident is the power of individuals to cause change. Whether it is the scientist speaking out for what she or he believes is right or Grade 2 students lobbying McDonald's to discontinue using foam containers, individuals can make a difference. CFCs used for food packaging accounted for less than two per cent of the total U.S. consumption in 1987, but the campaign against foam containers raised public awareness. The chemical industry is under increasing pressure, as it was in 1977, to reduce CFC emissions. As Roan states: "Thanks to environmental groups and a few hard-working legislators, some CFC users were convinced to act before regulations were issued."

The end of the beginning of this story comes with the signing of the Montreal Protocol to reduce the use of CFCs. But it was not until an actual connection was made between measurements of chlorine in the stratosphere over the Antarctic and the depletion of ozone that this agreement was reached.

Many problems and issues remain. The Montreal Protocol was praised for the agreement that it achieved and criticized for not going far enough. The Montreal Protocol will limit emissions by about one-third. Experts warn that cutbacks of at least 85 per cent are needed to allow the ozone shield to stabilize. Since September 1987, the calls for a stronger accord have been growing as evidence of an Antarctic ozone hole and an Arctic ozone "crater" becomes incontrovertible.

The parallel between the CFCs and climate change issues is striking. The successful negotiation of the ozone protocol paves the way for talks on climate change. Difficult choices are required. "Should the nation risk economic peril to act on a theory steeped in scientific uncertainty and whose consequences, even if true, might not be felt until late in the next century? Or is it better to wait until scientific certainty has been established and take the risk that the delay might lead to irreparable environmental damage that future generations would have to contend with?"

In Roan's words: "Students, policy makers and anyone who is concerned about the kind of earth they leave to their children and grandchildren should know the story of the 15-year ozone crisis, for it is a lesson for the future." I agree.

John Lilley is senior research officer of the Environment Council of Alberta.

AROUND THE PROVINCE

by Cathie Bartlett

Environmental Psychologist New ECA Head

Two experiences – one profound and one almost incidental – led Natalia Krawetz into an exciting and dynamic career on the front line of environmental issues.

The recently appointed chairman of the Environment Council of Alberta credits a near-death experience in Lake Ontario over 15 years ago with giving her a new perspective on life.

"I realized I didn't want to pursue traditional areas of psychology," Dr. Krawetz says.

"I wanted to do something different."

That "something different" presented itself during her final year of undergraduate study at York University, when a professor mentioned in passing a new course called environmental psychology at City University of New York.

The Ontario native spent 1971 to 1976 in the Big Apple, in a program so new "they were literally formulating the courses as we were taking them."

Environment was brand new, and it was exciting to be in on the ground floor of this field. Her colleagues were from all walks of life and disciplines, and that kept her on her toes mentally.

It was a rigorous program, but the New York years are ones that Dr. Krawetz recalls with obvious enthusiasm.

She began her work experience with a two-year stint at a Toronto engineering firm that was becoming involved in environmental impact assessments.

"I was their resident social scientist," she says.

She worked alongside "engineers, land use planners, geographers, biologists and the odd chemist. It was an interesting opportunity to work with different disciplines."

She then decided "to see how the other half lives" and get some experience with a regulatory body.

That brought her to Alberta, to a job in the Research Secretariat of Alberta Environment.

"The human part" was her area once again. Public involvement, social impact assessment, environmental education and health and some policy work kept her busy.

"I was there one year and I left to marry my boss," she says with a big smile. "I then did some freelance work."

Then it was on to the University of Waikato in Hamilton, New Zealand, where she and husband Bill MacDonald were hired for an assessment of Project Huntley, a coal and gas-fired power station. A university team had been monitoring the social and economic impacts of this power station and wanted Dr. Krawetz to give an evaluation from an overseas viewpoint.

After 10 months in New Zealand and two more months of travel, the couple arrived back in Edmonton in 1982.

They decided they liked working together and combined their specialties—science policy and social aspects of the environment and formed a company, "despite people saying it was not a good time to do so."

Hazardous waste, landfills, heavy oil, sour gas, water and air quality matters kept the fledgling company's phone ringing.

"Because I was on the social side, I was looking at public involvement or social impact, or sometimes policy implications."

Business was good, and a diverse client base from across Canada and into the U.S. and around the globe gave her wide-ranging feedback. (She was also a board member of Environment Views for part of this time.)

Others asked her to apply for the job with the ECA, an independent government agency intended to help the government make better decisions about environmental matters.

Her skills with dealing with people from various bases and with public groups holding different opinions will serve her well in her new job, because much of what the ECA does falls into these areas. The '90s are "vital in terms of the environment," Dr. Krawetz says. She has a five-point agenda for this year.

- The ECA has been asked to consider acting in a secretariat role, doing research and supporting participants in the round table on integration of the environment and the economy.
- The ECA is looking at ways it can become involved in the public involvement segment of the five-step legislative review announced by Environment Minister Ralph Klein.
- Dr. Krawetz is reviewing several background documents about Alberta's conservation strategy, produced by the ECA's public advisory committees, to see how the documents can best be brought forward.
- an internal review of the 18 permanent ECA staff members to see how resources are being used, and an internal review of the public advisory committees, getting feedback about future direction, both from committee members and members of some key stakeholders.
- an environmental audit of the ECA "to see how environmentally friendly we are. "I want this office to show that it is not only environmentally responsible, but to prove it can be done."

Oh Christmas Mulch

The real-life Christmas trees that decorated Edmonton homes this festive season are not gone for good.

They've been recycled – chipped into little pieces, they will be spread on park pathways and planted areas come spring.

"We have diverted about 100 metric tonnes (of old trees) from the landfill site," said Lloyd Egan, co-ordinator of recycling programs for the City of Edmonton.

The 30,000 trees rounded up make 100 tonnes of "very space-consuming" material, Egan added.

The city's environmental services department decided to cancel the annual Christmas tree bonfire in favor of the more environmentally friendly Christmas tree round-up, with Mayor Jan Reimer's encouragement. It's all part of the city's concerted effort to reduce the amount of garbage going into the landfill site.

Edmonton isn't the only city starting a tree round up. The city of Calgary did the same. Out in the Maritimes, residents of the zoo in St. John, New Brunswick will bed down on Christmas tree chips in the spring.

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ENVIRONMENT UPDATE

Old-Growth Forest Issues

The U of A Faculty of Agriculture and Forestry is sponsoring a public lecture by University of Washington forest ecologist Dr. Jerry Franklin on The Contribution of Old Growth to the New Forestry, at 3:30, Wednesday, April 4. The faculty is hosting the lecture, as well as a symposium on forestry research at the U of A at 1:30 April 4, as part of its 75th anniversary celebration. For further information, contact the faculty at 492-4413.

Tomorrow's Weather

The Oldman River Regional Planning Commission has released the proceedings of last year's conference on atmospheric change, Tomorrow's Weather: man-made or man-managed? It includes discussions on the greenhouse effect, weather modification and the impact of climate change, all with the Alberta situation in mind.

For a copy of the proceedings, contact Sharon Ouwerkerk at the Oldman Regional Planning Commission,
905 - 4th Avenue South,
Lethbridge, T1J 0P4
or call 329-1344.

Reclamation Award

The Alberta Chamber of Resources has chosen Cardinal River Coals Ltd. to receive its annual reclamation award, given to the company the chamber feels "has shown exceptional dedication and success in the area of reclamation."

Cardinal River won the award for its success in creating both wildlife habitat and a recreation area on disturbed land in the Eastern Slopes. The site now has a fishing lake and habitat for almost 300 bighorn sheep.

Greening of the Nineties

The Alberta Society of Professional Biologists and the Canadian Water Resources Association are jointly hosting a symposium on The Greening of the 1990s: Solutions to emerging environmental concerns, to be held October 23 and 24 in Edmonton.

For further information, contact Lynne Kemper at 422-4232.

Great Plains Climate

The Canadian Climate Program and the U.S. National Climate Program Office are hosting a joint symposium on Climate and its Impact on the Great Plains, to be held in Calgary September 11-13. This symposium is a follow-up on an earlier one at which climatic impacts on the Great Lakes were considered. Recommendations from the symposium will be made to senior officials of the U.S. and Canadian federal, state and provincial governments.

For further information, contact Rick Lawford, Associate Director, National Hydrology Research Institute, Saskatoon, Saskatchewan S7N 3H5.

Environment Week 1990 June 3 - 10

The Environment Week 1990 theme is "Our Environment Needs You." Alberta Environment offices throughout the province are participating in the program by organizing activities in their communities. Department staff will be on tour visiting southern Alberta communities to increase Albertans' awareness of environmentally friendly household practices.

Alberta Environment also supports the Environment Week Association's efforts, which support Environment Week activities in 35 communities across the province through industry, environmental groups, organizations, youth and educational organizations. For more information contact Alberta Environment's Education Branch at 427-6310 or the Environment Week Association at 426-4191.

1990 Environment Awards

Alberta Environment's fourth annual Environment Awards is accepting nominations until March 30, 1990. Awards are presented in each of the following categories:
- individual citizens
- industry, business or government agency
- educational institution or organization
- volunteer organization or service group

For more information call Alberta Environment's Communications Division at 427-6267.

If you have a short news item of province-wide interest you'd like to contribute to Environment Update, please send it to the editor at the address on the Contents page. The editor reserves the right to select and edit items.